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FORMERLY

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(Original Official Organ U. S. Vet. Med. Ass'n.)

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CONTENTS

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Vol. LXVIII, N. S. Vol. 21 January, 1926 No. 4

PRESIDENT ADAMS ON THE MOVE

Dr. John W. Adams, president of the A. V. M. A., has been in harness long enough to begin to appreciate that the presidency of our national veterinary organization carries with it something of the strenuous life. His services as a contributor to the programs of veterinary association meetings during the winter have been in heavy demand. Dr. Adams attended the meeting of the Pennsylvania State Association, in Williamsport, in September; the Lake States Tuberculosis Eradication Conference, in Indianapolis, in October; the annual meeting of the Southeastern States Veterinary Medical Association, in Atlanta, Ga., in November; the annual meetings of the U. S. Live Stock Sanitary Association and Horse Association of America, in Chicago; and the University of Missouri Short Course for Veterinarians, at Columbia, in December.

During the month of January, Dr. Adams is booked to attend meetings of the veterinary associations of the following states: Indiana, Minnesota, Maryland, Wisconsin, and South Dakota. In February, he will attend the Iowa meeting, at Des Moines; the Alabama Veterinary Short Course, at Auburn; and the University of Illinois Veterinary Conference, at Urbana. It is needless to say that Dr. Adams has found it necessary to decline a number of other invitations, simply because he could not be in two places at the same time.

PLAN NOW FOR LEXINGTON

As announced on another page in this issue, the Executive Board has fixed the dates for the meeting to be held in Lexington —August 17-18-19-20, 1926. Ever since the Portland meeting we have known *where* the meeting was going to be held. Now we know *when*, and can shape our plans accordingly. An outline of the program has been agreed upon tentatively, and is subject to minor changes.

Plans are under way for a conference of official representatives of state, territorial and provincial veterinary associations, for Monday evening, August 16, preceding the opening session on Tuesday morning. Saturday, August 21, has been left open for side trips, which will be arranged by the Local Committee on Arrangements, of which Dr. W. W. Dimock, of Lexington, is chairman.

BIRD'S EYE VIEW OF PROGRAM

	TUESDAY AUG. 17	WEDNESDAY AUG. 18	THURSDAY AUG. 19	FRIDAY AUG. 20
Morning	Opening Session	Sectional Meetings	Sectional Meetings	Business Session
Afternoon	Business Session	Business Session	Trip to Breeding Farms	Clinic
Evening	Alumni 6:00 President's Reception 8:00 Dance	General Session — Papers	Banquet	Open

VETERINARY "SLANGUAGE'

Newspapers are having a great deal to say on the subject of present-day vocabularies and the numerous slang expressions which are so much in vogue, particularly among the members of the younger generation. There is no denying the fact that "expressions in slang" are frequently very much to the point; they often carry a weight of argument that is not possible with Elizabethan purity. A new word has been coined to designate this modern product—"slanguage."

Slang expressions have their proper place, and we have no objections to veterinarians using them on proper occasions. On the other hand, there are places where the use of such terms is ill-advised and highly inappropriate. For example, at a meeting

of a large veterinary association, with a room full of veterinarians and others who were not members of the profession, a veterinarian, whose position alone, if for no other reason, should have deterred him from doing so, repeatedly used the term "hickey" to refer to a variety of swelling encountered in intradermal tuberculin testing.

It is not an infrequent occurrence to hear veterinarians speak of "shooting" serum and other agents into animals, when they mean "injecting." Such expressions occasionally find their way into veterinary literature (?). It is not good practice. It is unbecoming professional men. It breeds carelessness and slovenliness in other directions. For instance, some veterinarians refer to almost every biological product as "serum." Others prefer "vaccine" as their blanket term. Some diagnose every case of skin disease in a dog as "mange."

Anything that we have to say on this subject does not mean that it is not necessary to talk to farmers, and laymen in general, in their own language. We do not mean to suggest that veterinarians go to the other extreme and be "supertechnical," in everything they say and write. There is a happy medium and an appropriateness in all things. Above all, do not inject slang into scientific discussions.

APPLICATIONS FOR MEMBERSHIP

(See October, 1925, JOURNAL)

FIRST LISTING

MANNING, M. M. — Bagley, Iowa.
D. V. M., Iowa State College, 1920
Vouchers: A. C. Drach and Robt. D. Wall.

ROBERTSON, DUNCAN M. — 7 Hartley St., Brockville, Ont.
V. S., Ontario Veterinary College, 1912
Vouchers: C. D. McGilvray and R. A. McIntosh.

STAUFFER, L. R. — 3800 Grand River Ave., Detroit, Mich.
D. V. M., Ohio State University, 1925
Vouchers: J. E. Patterson and David S. White.

JONES, EUGENE CALHOUN — 8670 Santa Monica Blvd., Los Angeles, Cal.
D. V. M., State College of Washington, 1924
Vouchers: J. P. Bushong and W. L. Curtis.

Applications Pending

SECOND LISTING

Goss, Raymond C., Middlebury, Vt.
Humphreys, Bernard F., 839 East 42nd Place, Chicago, Ill.
Learmonth, Robert, 134½ W. Grand River Ave., East Lansing, Mich.
Whiffing, Harry E., 903 W. Meridian St., Lebanon, Ind.

COMING VETERINARY MEETINGS

Nevada State Veterinary Association. Reno, Nev. Jan. 4, 1926. Dr. Edward Records, Secretary, Reno, Nev.

Massachusetts Veterinary Association. Worcester, Mass. Jan. 5, 1926. Dr. H. W. Jakeman, Secretary, 44 Bromfield St., Boston, Mass.

Pennsylvania Conference of Veterinarians, University of. Philadelphia, Pa. Jan. 5-6, 1926. Dr. Louis A. Klein, Dean, 39th St. & Woodland Ave., Philadelphia, Pa.

California State Veterinary Medical Association and University of California Veterinary Conference. Davis and Sacramento, Calif. Jan. 5-6-7-8, 1926. Dr. J. P. Bushong, Secretary, 414 No. Larchmont Blvd., Los Angeles, Calif.

New York City, Veterinary Medical Association of. Academy of Medicine, 17 W. 43rd St., New York, N. Y. Jan. 6, 1926. Dr. C. G. Rohrer, Secretary, 40 W. 61st St., New York, N. Y.

Kansas Veterinary Medical Association. Topeka, Kans. Jan. 6-7, 1926. Dr. Charles Bower, Secretary, Topeka, Kans.

Ohio State Veterinary Medical Association. Ohio State University, Columbus, Ohio. Jan 7-8, 1926. Dr. W. R. Hobbs, Secretary, Ohio State Univ., Columbus, Ohio.

Oklahoma State Veterinary Medical Association. Lee-Huckins Hotel, Oklahoma City, Okla. Jan. 11-12, 1926. Dr. C. H. McElroy, Secretary, Stillwater, Okla.

Indiana Veterinary Medical Association. Hotel Severin, Indianapolis, Ind. Jan. 12-13-14, 1926. Dr. R. H. Boyd, Secretary, 446 E. 10th St., Indianapolis, Ind.

Maine Veterinary Medical Association. Portland, Me. Jan. 13, 1926. Dr. A. J. Neal, Secretary, 324 Essex St., Bangor, Me.

Conestoga Veterinary Club. Lancaster, Pa. Jan. 14, 1926. Dr. Henry S. Weber, Secretary, 27 E. Liberty St., Lancaster, Pa.

Cornell University, Eighteenth Annual Conference for Veterinarians at. Ithaca, N. Y. Jan. 14-15, 1926. Dr. V. A. Moore, Dean, N. Y. State Veterinary College, Ithaca, N. Y.

Minnesota State Veterinary Medical Association. St. Paul, Minn. Jan. 14-15, 1926. Dr. C. P. Fitch, Secretary, University Farm, St. Paul, Minn.

Virginia State Veterinary Medical Association. Richmond, Va. Jan 14-15, 1926. Dr. W. H. Ellett, Secretary, Midlothian, Va.

Mississippi State Veterinary Medical Association. Greenwood, Miss. Jan. 18-19, 1926. Dr. C. G. Stalworth, Secretary, Drew, Miss.

Pennsylvania State Veterinary Medical Association. Harrisburg, Pa. Jan. 20, 1926. Dr. H. R. Church, Secretary, Harrisburg, Pa.

Texas State Veterinary Medical Association. Fort Worth, Tex. Jan. 20-21, 1926. Dr. D. Pearce, Secretary, Leonard, Tex.

Arkansas Veterinary Association. Hotel Marion, Little Rock, Ark. Jan. 21, 1926. Dr. Hubert Shull, Secretary, Texarkana, Ark.

Maryland State Veterinary Medical Association. Medical Hall, Baltimore, Md. Jan. 21, 1926. Dr. E. M. Pickens, Secretary, College Park, Md.

Michigan State College Short Course for Veterinarians. East Lansing, Mich. Jan. 25-26-27-28-29, 1926. Dr. Ward Giltner, Dean, East Lansing, Mich.

New Jersey, Veterinary Medical Association of. State Agricultural College, New Brunswick, N. J. Jan. 26-27, 1926. Dr. G. P. Ellice, Secretary, Rutherford, N. J.

Wisconsin Veterinary Medical Association and University of Wisconsin Short Course for Veterinarians. Madison, Wis. Jan. 26-27-28-29, 1926. Dr. O. H. Eliason, Secretary, 226 W. Gilman St., Madison, Wis.

Capitol Veterinary Medical Association. East Lansing, Mich. Jan. 28, 1926. Dr. A. E. Erickson, Secretary, Charlotte, Mich.

South Dakota Veterinary Medical Association. Sioux Falls, So. Dak. Jan. 28-29, 1926. Dr. C. C. Lipp, Secretary, Brookings, So. Dak.

Alabama Veterinary Medical Association and Short Course for Practitioners. Auburn, Ala. Feb. 1-2-3-4-5-6, 1926. Dr. C. A. Cary, Secretary, Auburn, Ala.

Iowa Veterinary Association. Savery Hotel, Des Moines, Iowa, and Iowa State College, Ames, Iowa. Feb. 2-3-4-5, 1926. Dr. E. R. Steel, Secretary, Grundy Center, Iowa.

Connecticut Veterinary Medical Association. Hotel Garde, New Haven, Conn. Feb. 3, 1926. Dr. Geo. E. Corwin, Secretary, 11 Warrenton Ave., Hartford Conn.

Florida State Veterinary Medical Association. Tampa, Fla. Feb. 12-13, 1926. Dr. A. L. Shealey, Secretary, University of Florida, Gainesville, Fla.

LAPAROTOMY IN THE COW*

By J. N. FROST, *Ithaca, N. Y.*

Professor of Surgery, N. Y. State Veterinary College

Laparotomy in the cow is an operation that is well borne by the animal and one that we might do more often with beneficial results. For the purpose of diagnosis, laparotomy is of considerable importance in cases of necrobacillosis, cirrhosis, and abscess of the liver, as well as adhesions around the reticulum and liver. It is also an important part of the operation in cases of acute indigestion, foreign bodies, and impaction, which call for rumenotomy, intussusception, spaying, adhesions of the uterus, abscess of the ovaries, torsion of the uterus and cesarean.

Laparotomy may be performed on either the right or left side of the body, depending upon what intra-abdominal area one wishes to reach. The area is in the flank, between the last rib and the external angle of the ilium. If one wishes to explore the anterior part of the abdomen, or manipulate the reticulum, by way of the rumen, for the presence of foreign bodies, it is well to have the incision not too far back from the rib, so that these points may be reached more easily. Otherwise, the incision is made about midway between the two points. The area is shaved and disinfected. A local anesthetic is introduced under the skin, along the line of incision, and then the muscle along the same line is anesthetized.

In most cases, the operation may be performed on the standing animal, drawn up against the side of a stall. When anesthesia is satisfactory, an incision is made through the skin, starting a short distance below the lumbar processes, and carried downward eight inches or more, depending on the operation to be performed on the abdominal viscera.

In going through the abdominal wall, one of two methods may be followed. If there is need for haste, the oblique muscles may be cut across and the peritoneum punctured. Another preferable method of making the abdominal wound, after incising the skin, is to separate the external oblique muscle obliquely downward and forward between the muscle fibers, and the internal oblique downward and backward, so that the two incisions cross in more or less of an X-shape. The peritoneum is then

*Presented at the Sixty-second annual meeting of the American Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

picked up and punctured. The advantage in this is that, following the operation, no suturing of the muscle is required.

Closing the Wound

In closing the laparotomy wound, it is not necessary to suture the peritoneum, and if the muscles of the abdominal wall have been separated, instead of cut across, they will not need suturing. The skin may then be closed, and for this we prefer the mattress suture. In a large wound, if the muscles have been cut across, they should be sutured with catgut or, if silk is used, they are sutured in such a way that the suture material may be removed without opening the skin wound.

If there has been a chance for considerable infection of the laparotomy wound, it is well to use a drainage tube at the lower edge of the wound. A strip of antiseptic gauze may be used for this purpose, or the so-called cigarette drain may be used. This consists of a strip of gauze wrapped in rubber. A piece of old rubber glove may be used to wrap up the gauze, or a piece of rubber tubing will do. If the rubber is used, it may be prevented from sticking to the tissue by coating with grease or salve of some kind. We like to coat the rubber with 1-1000 solution of of acriflavine in glycerin, which does not seem to irritate the wound and at the same time prevents adhesion of the tube to the wound tissue.

After disinfecting the closed wound, a dry piece of cotton may be drawn up against the hairs to cover the edge of the wound. If drawn against the hair, it will stay in place and protect the wound for considerable time. After five or six days, the skin sutures may be removed and the ridge produced by the mattress sutures allowed to draw down, to leave a smooth surface.

Probably the most common reason for laparotomy is to open the rumen to relieve acute indigestion or impaction or to explore the reticulum for foreign bodies.

In acute indigestion, as soon as the laparotomy wound is made, the rumen is usually forced by internal pressure into or out through the wound. One precaution that it is necessary to take in opening the rumen is to prevent food from entering the peritoneal cavity. When the rumen is incised, forceps or sutures may be used to draw the rumen out and towels or sterile gauze placed over the edge of the laparotomy wound and the incised wall of the rumen. A method we like better is to suture the wall

of the rumen to the skin, before incising the rumen. These sutures should be placed far enough to each side of the point where the incision is to be made through the rumen, so that, when the incision is ready to be closed, the first row of sutures can be placed in the wall of the rumen without disturbing the retaining sutures. The rumen can then be incised, and the food cannot get down into the peritoneal cavity.

Another Method

Still another method is to draw the rumen through the laparotomy wound with heavy forceps and then make the incision. The edge of the incised wall can then be sewed to the skin, back an inch or so from the skin incision. As much of the contents of the rumen can now be removed as is desired. We prefer to remove all we possibly can. One cow upon which we operated, and from which we removed more than two hundred pounds of wheat, continued to pass wheat in the feces for ten days thereafter.

In case of coma or stupor, after removing the food, it is well to inflate the udder with air or oxygen. In fact, in any case of indigestion or intoxication from the stomach or intestinal tract the inflation of the udder is an important part of the treatment and sometimes gives surprising results.

Before closing the incised rumen, it is well to introduce an antiseptic and carminative to check any fermentation and accumulation of gas. A small amount of gas is sometimes quite painful, and may force some liquid or particles of food out into the wound.

In the surgical relief of foreign bodies producing traumatic indigestion, the trouble is to get a positive diagnosis early. Probably a much greater proportion of the cases of indigestion in cattle are due to traumatic origin than are diagnosed. When we consider that a cow is rarely killed that does not have some foreign bodies in the reticulum, we can readily believe that they cause much more trouble by puncturing the wall of the stomach than is ever diagnosed. In fact, it is only occasionally that we have a diagnosis made positively until the foreign body has advanced far enough forward to wound the pericardium.

Traumatic Indigestion

In the treatment of traumatic indigestion, it may be necessary to remove some of the food from the rumen before introducing the hand into the reticulum to make a careful search for foreign

bodies. If the foreign material has punctured the wall, there may be only a small portion left in the reticulum, as in the case of a nail, with the head only lodged deep in the honeycomb of the stomach. Of course, the foreign body may have punctured the wall and passed completely from the stomach, as often happens with pieces of wire.

In passing through the stomach wall, the inflammation which is produced would cause an adhesion between the wall and the surrounding tissues. This helps one in locating the foreign body, for by taking hold of the wall of the reticulum and attempting to move it, one can readily locate any adhesion which may be present.

When treating an impaction of the third stomach, one may pass water directly into the leaves by introducing a tube through the rumen and into the third stomach. In treating this condition, if one does not wish to open the rumen, considerable good may be accomplished by massaging the wall of the stomach by means of a laparotomy incision in the right flank.

When ready to close the wound in the rumen, the edges should first be wiped with a mild antiseptic or salt solution to remove any ingesta which has accumulated. The wound is then sutured with silk or linen, using an intestinal suture. In placing the sutures, care should be taken that they do not pass through the wall of the stomach, but include only the serous and muscular coats. We prefer to use three rows of sutures for this, each row burying the preceding row. If the rumen has been sutured to the skin before incising, it will be necessary to remove these retaining sutures after the first row of permanent sutures has been placed.

Intussusception

The symptoms of intussusception are usually ushered in with violent colic, the animal kicking at its belly, pawing, and sometimes lying down and rolling. Rumination and the passing of feces is stopped, but small masses, streaked with blood and covered with mucus, may be passed. The rectum contains mucus and blood clots.

Another important symptom is the increase in pulse, often as high as 120, without an increase in temperature. Bloating is absent. After a few hours, the intestine often becomes necrotic and the colicky pains then are lessened. The animal still appears nervous, treads with the hind legs, switches the tail, and some-

times stretches. The intussuscepted intestine may be recognized per rectum as a curved, sausage-shaped mass, much firmer than the normal intestine. Occasionally, an intussuscepted intestine may be straightened out by manipulation, but this is rather a dangerous procedure, as the intestine may be too necrotic to allow much manipulation.

The animal may be operated on either standing or cast. Anesthesia may be secured by chloral per rectum and local anesthesia along the line of the laparotomy incision. No anesthesia is necessary for the intestine, provided the mesentery is not pulled too strongly.

The laparotomy incision is the same as for rumenotomy, except in the right flank. The operative field is covered with a sterile gauze or cloth, and the involved intestine is drawn out. An attempt may now be made to straighten the intussuscepted intestine.

Resection of the Intestine

If necessary to perform resection, clamp the intestine each side of the diseased part with forceps, the jaws of which have been covered with rubber. The intestine is then severed between the forceps and the diseased part, the incision being continued in the mesentery for three or four inches in a V-shape. The cut ends of the intestine are washed with salt solution to remove the intestinal contents and prevent contamination of the healthy intestine. The forceps are now brought together, and a long suture passed through the mesentery, close to the intestine, and another through the opposite border of the intestine.

If desired, the forceps may now be removed and the long sutures used to keep the edges of the intestines tense while being sutured. Two rows of silk sutures are inserted, the second row covering the first. Either a continuous or interrupted intestinal suture may be used. The interrupted suture allows a little more dilation of the intestine than the continuous. After these two rows of sutures are in place, the mesentery is sutured. An important part of the operation is the washing of the intestine with a warm, normal, salt solution, until normal peristaltic movements are established. When this is done, the intestine is replaced and the laparotomy wound closed.

In cases of adhesion of the uterus to the surrounding tissues, the animal is quite likely to be sterile, or the development of

the fetus is interrupted by an abortion. If these adhesions do not involve the ovary and tubes, they may be relieved surgically and the animal continue to breed. In case of abscess of the ovary and tubes, the removal of these inflamed parts may save the breeding life of the animal for many years.

Torsion of the uterus is another condition that may be sometimes relieved by passing a hand through a laparotomy wound and attempting to roll the uterus back. In many cases, however, the uterus is so badly congested and diseased that it is not safe to apply much pressure against it.

DISCUSSION

DR. W. H. LYTLE: In suturing the rumen to the skin, where do you make your insertion of the suture, at the top of the incision or the bottom, or at the sides?

DR. FROST: All the way around, particularly at the bottom. You can suture around the lower part of your incision.

DR. LYTLE: I suture the top and the bottom, and not at the sides.

DR. R. R. DYKSTRA: I was very much interested in reading, in one of the journals a month or so ago, of an operation upon the reticulum for the removal of foreign bodies, and I planned, at that time, if the occasion ever presented itself, to attempt that operation. I do not recall just now the name of the author. The operation was described for the removal of foreign bodies in the reticulum, and consisted in making the incision over the xiphoid cartilage of the sternum, the animal being placed in dorsal recumbency. The author, as he described it, made the incision down to the xiphoid cartilage, then introduced the finger and, without incising the xiphoid cartilage, pulled it down out of the wound. That exposed the reticulum so that it could be opened and the foreign body removed.

If I recall correctly, the writer contended that by that method he had removed reticular foreign bodies and those that had passed forward in part through the diaphragm and entered the pericardial sac. A good point in regard to that operation was that, when completed, and after the reticulum had been closed in the usual manner, the xiphoid cartilage could be permitted to slip back through the incision, and that very largely automatically closed the wound; the skin, of course, being sutured over it.

I have been very much interested in that operation, and I thought if the occasion presented itself, I would resort to that technic.

CHAIRMAN STEEL: Dr. Frost has told me of an operation of cutting through the ribs and doing some work on the heart sac. Will you describe that, Doctor Frost?

DR. FROST: That is an operation we have been trying, in those cases where the foreign body has gotten forward so that you have the development of a pericarditis, particularly if there is the collection of fluid in the pericardial sac. It simply consists in cutting down between the ribs, over the pericardial sac, and opening the sac and draining it in that way, and if possible, securing the foreign body from that point.

I have one heifer in the hospital at the present time. I got this cow in for the State Society meeting, for the purpose of operating. We had to hold her a number of days in order to have her for that meeting, so she should have been operated on before she was. She was one of the cases where we had extensive edema, all along through the chest, up along the throat, and underneath the jaws. She also had edema along the belly wall. We made the incision down through the intercostal muscles and got hold of the pericardial sac. We found adhesions of the pericardium to the heart. There was also adhesion of the pericardial sac to the surrounding tissues. With the hand, we broke down these adhesions, passing the hand directly around the heart in the pericardial sac. Then we passed our hand posterior, and could not

find any foreign body present at that time, and so we simply swabbed out the pericardial sac with acriflavine and glycerin, one to one thousand. Then we placed a chlorazene pack over the incision through the intercostal muscles, and sewed up the skin. At the present time, the cow is recovering satisfactorily. I had a letter from our man, and he said he could not kill her if he tried. The edema, in three days' time, had disappeared from her throat and abdominal wall. It was a long time before the edema entirely disappeared in the pectoral region. That gradually disappeared. I went away the next day after the operation, and was away three days. When I came back, the cow was eating. When I looked at her she was chewing her cud and eating feed in pretty fair shape.

That heifer is a registered Holstein, between one and two years of age, and five months pregnant, and that is one reason we attempted to do something for her.

In those cases where you have fluid in the pericardial sac principally, edema with perhaps large masses of fibrin, we have simply punctured and drawn off that fluid where the foreign body is either walled off or perhaps drawn back into the reticulum, and had the animal get well. I have tried cases where the material was badly infected. Those cases usually have so much infection that your animal dies from septicemia. You do not get results from those cases, as a general thing. I had one at the University. I opened the pericardial sac and got out a couple of pails of very dark liquid, with considerable odor, indicating extreme infection. By the way, we operated on this cow standing, and with simply local anesthesia. She stood in her stall without any means of control, except tied up to a ring. We drew off these two pails of liquid; then I got my hand in around the sac and found a wire. We removed that wire. She had so much infection that we had quite a severe pleurisy develop, and she died about two weeks afterward.

I think there is a chance, in selected cases, along this line. If we watch our cases carefully, I think there are some where you have a collection of fluid around the heart sac, that can be saved by drawing off the fluid. I know it can, because I have done it, and saved the life of the animal, but so many of the cases have gone so far before we make our diagnosis that it is hopeless.

DR. M. L. OLSEN: Is it necessary to resect a rib, or do you go between two ribs?

DR. FROST: I went between two ribs. It will squeeze your hand pretty good and tight to get in. With a heifer, you can spring the ribs. I never have had to resect a rib. This heifer I told you about was a comparatively small heifer, not two years of age. Still I was able to get my hand down in, so I could work around the heart sac. It does pinch your hand pretty bad, but you can do it.

DR. DYKSTRA: What intercostal space do you prefer?

DR. FROST: I have not paid much attention. If I were to guess, I would say the fifth intercostal space. I have simply gone over the heart sac by listening to the heart sounds. That is really the way I locate my intercostal space for incision.

DR. J. E. MCCOY: You say you open the pericardial sac. After you get your drainage made, do you close with suture or leave the opening there?

DR. FROST: I leave it open. I doubt if you could suture it without taking out a piece of the rib.

A GOOD REASON

"What's the matter, old boy?" asked Jimmie's friend. "I've never seen you looking so seedy."

"I've got to go abroad at once," remarked Jimmie gloomily.

"Nonsense! These doctors mustn't frighten you out of your life like that."

"It wasn't a doctor. It was a lawyer."

OVARY AND TESTICLE TRANSPLANTATION IN VETERINARY PRACTICE*

By C. M. HARING, *Berkeley, Calif.*

College of Agriculture, University of California

Transplantation is not a new thing in surgery. In the Eighteenth Century John Hunter, a London surgeon, grafted various tissues in fowls and obtained some results. Tissue transplantation has been chiefly used for biological research, and a vast literature exists, describing experiments on crustaceans, amphibians, birds and mammals. A common practice is to cut the tissues in thin slices and insert them into some highly vascular organ, such as the spleen or a muscle. The sex glands lend themselves especially well to this type of experimentation.

No book well suited to the needs of veterinary practitioners exists on gonad transplantation. Chapters relating to the subject are contained in the following publications:

The Physiology of Reproduction—
by F. H. Marshall; 2d edition—
Longmans, Green & Co., London, 1922.
Endocrinology and Metabolism—
5 volumes by various writers—
D. Appleton & Co., New York, 1922
The Sex Glands of Internal Secretion—
by A. Lipshutz,
Williams & Wilkins Co., Baltimore, 1924.

The term "autoplastic" is employed when the tissue is grafted into some part of the body of the same individual from which it was removed. A "homoplastic" graft is one made from one animal to another of the same species, while "heteroplastic" is the term applied to grafting from one individual into another of a different species.

It should be kept in mind that the gonads have two distinct functions: (1) the formation of germ cells (ova or spermatozoa) and (2) the production of endocrines or sex hormones.

OVARY TRANSPLANTATION

Autoplastic transplantation of ovarian tissue is reported to be comparatively easy. It has been commonly used in human practice for many years. For example, 1895, Morris,[1] when removing the Fallopian tubes from a woman, succeeded in transplanting a piece of her ovary to the interior of one ovi-

*Presented at the sixty-second annual meeting of the American Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

duct. Pregnancy followed, terminated by an abortion. He also[2] grafted a "wedge-shaped ribbon" of ovarian tissue from one woman to another from whom both ovaries had been completely removed. The tubes were normal and a full-term pregnancy occurred four years later.

Two years ago, Professor W. Frei, of the University of Zurich, called the attention of veterinarians to the claims of Steinach, that the transplantation of an ovary from one female to another of the same species stimulates its own ovaries to the production of follicles and ova. For example, by this operation, in senile female rats, the disappearance of indications of age and the re-establishment of the activity of the sexual apparatus is induced. Some interesting applications of this principle are now being made in veterinary practice in Switzerland.

The first experiment reported was by Frei and Kolb[3] on a fourteen-year-old female goat, which exhibited pronounced signs of advanced age. She was completely hairless on one side of the body. Her udder was shrunken and functionless, the animal being sterile, and no estrum had occurred for three years. Weakness was so great, she was unable to rise without assistance. The skin was stiff and dry, that of the abdomen hanging in great folds. The subcutaneous fat had disappeared.

The ovaries from a twelve-weeks-old kid were transplanted with aseptic precautions. They were first freed from all attachments and cut in several pieces. One piece was inserted subcutaneously, two pieces intramuscularly in the region of the croup, and one intraperitoneally. Care was taken to fasten the intramuscular transplants with catgut so that the cut surface of the ovary was held against a cut surface of muscle. The wounds healed by primary intention.

In about a month, the goat became more active, was able to rise without assistance, and the udder began to fill out. In two months, a complete covering of hair had grown out. The body weight rapidly increased. Five months after the operation, the goat showed marked estrum, lasting three days. It was bred and in due time gave birth to a well-developed, living kid. Unfortunately, the goat soon became affected with gangrenous mastitis and had to be killed.

Quite similar results in Italy, in rejuvenating a sixteen-year-old bitch, have been reported in abstracts translated by Eichhorn.[4]

Ovary transplantation, however, has recently proved useful in conditions quite the opposite of senility, i. e., in so-called sexual

infantilism in heifers. The writer had the privilege of observing Dr. F. Grüter, of Wilisau, Switzerland, operate on such a case. The animal was a heifer of the spotted Swiss breed, nearly three years of age, and, according to the owner, had never been in heat. Rectal palpation revealed the fact that the uterus was smaller than normal and the ovaries were about the size of lima beans. They felt smooth and apparently contained no large follicles or corpora lutea. The treatment consisted in intramuscular grafts of pieces of the ovaries from a yearling heifer. One of them contained a corpus luteum, evidently from the follicle of the previous estrous cycle. This was removed, and the ovaries cut in half and placed in a sterile petri dish.

The engrafting operation consisted in dry-shaving an area, the size of the hand, on the side of the heifer's neck. This area was then painted with iodin and an incision through the skin, about three inches long, was made parallel with the long axis of the body. The fascia covering a large muscle of the neck was then incised and a pocket formed by removing a piece of muscle the size of a hazelnut. Hemorrhage was controlled and one-half of one of the ovaries inserted in the pocket. The slit in the fascia was closed by catgut and the incision in the skin by silk sutures. A similar implantation was performed on the other side of the neck. No change in the sexual behavior of the heifer was observed for two months. The operation, therefore, was repeated, after which she came in heat and was bred. I have no further record of this case.

Stählei[5] has reported forty-three similar cases. In cases yielding to the operation in a satisfactory way, estrum appeared after the transplantation in from two to sixty-seven days and, in most cases, between the seventh and fourteenth days. The results were as follows:

Out of 43 cases, estrum appeared in 37, or 85 per cent.

Out of 41 cases, conception occurred in 25, or 61 per cent.

Out of 31 cases, parturition occurred in 15, or 48 per cent.

It is believed that healing by first intention is more likely to take place if the ovary is maintained at body heat during the time it is being transferred. Ovaries which are to be transported some distance should be placed in a thermos flask containing physiological salt solution at 37° C., Stählei stated.

Ovary transplants were used with success in cases where cantharides, yohimbin, fructus capsici and ovarian massage failed, according to Stählei.

Castle and Phillips[6] grafted spayed albino guinea pigs, ranging in age from one month to one year, with ovaries taken from black guinea pigs ranging in age from one day to one month. In most of the attempts the transplantation failed, but in eight cases the grafts took, and in two cases normal reproductive power was restored. The chief point of interest in this experiment is that the offspring were all stamped with the characteristics of the donors of the grafts and showed no hereditary influence from the grafted mother.

Long and Evans[7] exchanged the ovaries between immature and mature rats, the transplants being made in the rectus muscle. All of the old ovaries placed in the young rats failed to "take." On the other hand, the immature ovaries placed in the adults grew rapidly and, in every instance, in from six to eight days, brought on typical estrus of the host. Studies of such ovaries showed that enlargement and bursting of follicles and the production of corpora lutea had occurred. The remarkable point to this experiment is that ovaries from rats only twenty-two days old, by their contact with mature tissue, were brought to full maturity in about a week, an acceleration of about two months for rats.

It may be inferred from these experiments that ovaries from young calves would also be very suitable material for transplantation.

The fact that veal calves are frequently available to be slaughtered on most dairy farms furnishes an opportunity to secure ovaries for experimental transplantation. The possibilities for the trial of such material in the treatment of various functional and anatomical disorders of the ovaries of cows are not yet realized by the average American veterinarian.

Before I continue with the paper, I will pass around two books, to be referred to later, in which the technic of two methods of transplantation is illustrated. This one, by Lichtenstern, "Transplantation of the Human Testicle," shows the method followed in Vienna, and consists simply of the insertion into the muscle of the abdomen of pieces of gonad tissue, essentially the same technic as I have just read to you. Another technic is used in France and to show you, I have torn out these portions of Voronoff's book, the surgeon in Paris who specializes on this technic. On account of a law in France, even when testicular or ovarian tissue is available for transplantation from one human being to another, it cannot be made because the law says that

no solid portion of a human being may be transferred from one individual to another even with the consent of all parties. Voronoff therefore established the monkey farm in Africa from which he secured his material. This shows his technic by which he transplants the testicular tissue into the scrotum. I do not consider this applicable in veterinary practice, but it may be of interest to you.

Testicle Transplantation

Testicle transplantation in the treatment of lack of potency in male domestic animals appears to be worthy of trial by veterinary practitioners. Grüter,[8] of Wilisau, Switzerland, reported the operation on three bulls of the spotted Swiss breed, aged fifteen, sixteen and eighteen months, respectively. All three evidenced retarded growth, poorly developed bone and muscle, markedly undeveloped necks, especially along the top-line, and cow-like heads. In spite of their ages, they were of infantile type and quite indifferent to a cow in heat. Two bulls, showing the same characteristics, served as checks.

The operation was performed on the neck, the technic being similar to that already referred to in describing the ovary transplantation by Grüter. The material consisted of pieces of testicular tissue, the size of hen eggs, secured from a freshly-slaughtered bull of vigorous breeding age.

After two or three weeks, the infantile bulls began to exhibit more vivacity and, in another week, the masculine characteristics began to develop, the absence of which has been previously described. Libido appeared in seventy, ninety-nine, and one hundred twenty days, respectively.

The two infantile bulls used as controls, which had not been operated upon, continued unchanged and sexually indifferent. These control animals were of the same race and about the same age.

A few months after the operation, the implanted tissue was removed from the necks of two of the bulls and sent to the Veterinary Pathological Institute, at Zurich, for examination. A report on the histological findings had not been made when I left Zurich, but Dr. Grüter stated that the removal of the implanted tissue had not reduced the potency of the bulls.

Voronoff[9] in perfecting his technic, made one hundred fifty testicular grafts in large animals, choosing various locations, such as the muscles, the peritoneum, the abdominal cavity, the

tunica vaginalis and the testicular parenchyma. He came to the conclusion that the tunica vaginalis furnished the most suitable location. In his experiments, Voronoff uses thin slices of testicle, suturing the pieces within the scrotum, either just outside or just inside the tunica vaginalis. He claims[10] that the homoplastic grafts cause improvement in the virility of aged boars, male goats, rams and bulls. However, the technic required for implantation on this tissue is complicated and the location is not so convenient in large animals as the procedure used by Kolb, Grüter and Stählei, previously described in this paper. This technic has been also successfully used by Lichtenstern,[11] of Vienna, in human surgery, in the treatment of war-wound castrates, homosexuality and eunuchoidismus due to underdeveloped testicle.

Fish[12] castrated two male goats at the age of 74 and 83 days respectively. When they were nearly two years old he operated on each by inserting between the skin and muscle of the flank a hickory-nut-sized piece of testicle from a bull. Eight or ten days afterward both showed some indications of sexual desire which was considered to be evidence of a mild response to the implanted orchic tissue.

According to Lespinasse,[13] in homo transplants there is, in the higher animals, an immediate loss of spermatogenic function with complete degeneration of spermatozoa-forming elements in the transplant. The interstitial cells remain and increase in number, retaining their staining properties, the same as before the operation. Just how long the interstitial cells live and function after a successful homo transplant is still a question subject to dispute. If a "take" occurs, they will often live as long as the host. If sufficient vascularization fails to develop, the interstitial cells degenerate in a few months.

The experiments of Steinach,[14] Sand,[15] and a large number of other biologists have shown that even a small functional part of one sex gland is able to maintain the typical somatic and psychical characters of the animal represented by the graft. Such experiments on guinea pigs, dogs, sheep and goats, and rats, have only indicated what may be found true for larger animals as those methods come into more general use by veterinary practitioners.

So long as gonad transplantation in veterinary practice is in a distinctly experimental stage, it would not seem good policy to depend upon it in treating impotency in a bull whose service was necessary for the continuance of the herd, but rather to dispose

of the animal, as is the present method, and buy a new one. In circumstances where the success or failure of the operation does not involve the continuance of the well-being of the herd, opportunity to try it out should be welcomed.

Naturally, a practitioner would be very cautious in making any claim for a proposed operation. In fairness to the owner, he should state that it is purely an experiment, and, until extensive use in veterinary practice has demonstrated its value, a charge for the operation could be justified only in exceptional cases.

The technic of the operation is so simple that it may be performed by any veterinarian, and it is to be hoped that our profession will be spared the stigma which has attached itself to the medical body through the development of so-called gland specialists.

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DISCUSSION

DR. J. N. FROST: A question regarding the conditions under which the bulls were kept—did they get any exercise or were they kept in stalls?

Another question is in regard to the transplanting. If I understood you correctly, you said in some cases, if circulation was established, the piece of testicle remained in the tissue; in other cases, it was simply absorbed. Is that correct?

DR. HARING: Yes.

DR. FROST: Was there any difference in the result, where it was absorbed, or where it remained in the tissue?

CHAIRMAN STEEL: Any other questions? Dr. Haring will answer all these questions at one time.

DR. A. EICHHORN: This paper probably is one of the greatest interest and importance to veterinarians attending this convention, for the reason that it opens up, I believe, a new field of activity for the veterinarian. I have followed with the greatest interest the development of organo-therapy, as I always felt that this phase of medicine will lead to the rational treatment of many conditions which heretofore were obscure to the medical men. As you know, in human medicine, and to some extent in veterinary medicine as well, some of the organ extracts have proved of unlimited value, such as epinephrin, pituitary extract, insulin, etc. These, however, are only few when compared with the other possibilities along this line. It will, of course, require a great amount of research to develop proper methods of procedure in the preparation of these products, the isolation of the active principles, the means of administration, and also the indications for their application. Nevertheless, marked progress has already been achieved, and further development along these lines is only a question of time.

With regard to the use of extracts of the sexual organs, it is still impossible to formulate an intelligent opinion as to their actions and the duration of the accomplished results. Likewise, it is by no means conclusively proved whether actual transplantation of the active tissues is required, or whether the same results are obtainable by ingestion or injections of the tissues or their extracts. The utilization of extracts made from various parts of the genital organs of animals has been employed in veterinary medicine, and some favorable, some indifferent, and even unsatisfactory reports have been published from their use. The actual transplantation of the active tissues proper, however, has been undertaken only to a very limited extent by veterinarians. Considering the simplicity of the procedure, as seen from the report of Doctor Haring, in practices of this kind in Switzerland, there can be no doubt of a greater dependability from the method of actual transplantation. It also makes it possible for the practitioner to apply the same in practice in cases of impotency or other breeding deficiencies.

It is unquestionable that transplantations have proved effective in certain cases, as may be seen from the authentic reports of dependable investigators, and, for this reason, the suggestions of Doctor Haring, with regard to the extension of the experimental work in a much broader way, should be given earnest consideration. Those in charge of clinics, and veterinarians with favorable opportunities and qualifications for this kind of work, could readily undertake such investigations, and if proved effective, it might be made practical for use by the practicing veterinarian.

Dr. R. R. Dykstra: We have had no extensive experience in work of this kind. About three years ago, one of the Holstein bulls at the Kansas State Agricultural College gradually lost all sexual desire. He was apparently in good physical condition. I examined him many times, and could find nothing wrong, but the herdsman told me that the testicles were gradually becoming smaller. We proceeded to operate, because the animal was a valuable one, though he was becoming valueless for breeding. We had a young Shorthorn bull which we castrated. We took the testicles, made scrapings from the center, mixed them with normal saline solution and injected it intraperitoneally into the Holstein. We waited quite a while, and never got any results from that injection. That was three years ago.

Six weeks ago, I was again consulted, and this time it was a son of the bull that I had formerly operated upon, and the son is going the same way. He is only three years of age now, and I went to work and operated, by ligating the vas deferens of the right testicle. When I returned, the wound had healed, but the bull had not been tried after the operation, so I do not know what the result will be. That is the extent of our experience.

Dr. A. J. Ronsse: I would like to cite two cases I have on record, of cows that were apparently sterile. After repeated ovarian massage, we had no results. I tried some of Dr. Sorenson's ovarian extracts, manufactured in his laboratory, as a last resort. I gave these cows two 10-cc doses, and they are both pregnant now. I can not say whether the results came from the ovarian massage or the ovarian extract. However, I had no result from the ovarian massage, so I gave the credit to the extract.

Dr. A. F. Hanna: In a case of sterility, where there seem to be no spermatozoa, would the operation be of value?

Dr. J. W. Cook: This has been a very interesting discussion, but talking about the transplanting of glands, I wonder if we had better not transport those animals down to Douglas County, where I moved. I had a stallion, quite a good horse, but he did not pay any attention to mares whatever. His glands were apparently normal, but he failed to produce any colts at all. About a year ago, I moved down to Douglas County. I quit practicing and bought a ranch. I had that stallion brought down. I had a good big draft mare in the field. Last Sunday, she brought in a nice big colt. I think you had better send them all down to Douglas County.

Dr. Dykstra: I would like to relate one little thing that was told me ten or twelve years ago by Professor Lippincott, professor of poultry husbandry in the Kansas State Agricultural College, at that time. He is now at the University of California. Professor Lippincott had had an extensive

experience in the caponizing of poultry. He informed me that occasionally in removing the testicle, he smashed it accidentally, and a portion of the testicle would drop into the peritoneal cavity, and it was his experience that whenever that occurred, the bird never assumed the characteristics of the capon, but always the characteristics of the male entire bird.

DR. DAVID F. FOX: Have they had any experience or tried this experiment on old bulls that have lost both sexual desire and potency?

CHAIRMAN STEEL: A few years ago, I was caponizing poultry for my own use. Several of them were slips; we would leave a part of the testicle. Later on, I ate those myself and conducted postmortems. I found the testicle fully developed. The capons would crow and develop a comb a good deal the same as other roosters.

I would like to ask whether or not this effect was permanent in the aged bulls. Dr. Ravenel, of the University of Missouri, in discussing this subject before the Missouri Valley Veterinary Association some time ago, following an address on "The Prolongation of Life," said that in the human, the stimulus was very transient and, in fact, hurried the process of senility.

DR. HARING: In answer to Dr. Frost's question, as to how these bulls were kept, I would say that the customary way in Switzerland is to keep the animals more or less confined in stables, particularly the bulls. They are led out daily for water, but they are fed in the stables, and these stables are usually very dark, with quite an absence of sunlight. Swiss veterinarians are constantly commenting on this method in connection with the sterility in both male and female cattle, which is so prevalent in Switzerland. I have no knowledge of how these particular bulls, shown on the screen, were kept, but probably they did not receive as much exercise as the average young American bull would receive.

The question was asked regarding the difference in the result when the tissue becomes fully absorbed, as compared with a case where it remains intact. I do not know of results in large animals. There is an enormous amount of literature with regard to such observations in rats, guinea pigs, and also to some extent in dogs and goats. We are justified in concluding that when the tissue is absorbed, only a transient effect is produced. We are justified in believing that some effect is produced, even when no additional growth of the implanted tissue occurs, and that this effect is probably somewhat longer than would be the effect of simply the injection of a tissue extract.

In cases where the tissue implantation is vascularized, as pointed out in the paper, the result is more or less permanent. When insufficient vascularization occurs, partial reduction may occur and later complete atrophy. These answers are made with reference to observations on small, experiment animals.

Dr. Dykstra mentioned the use of testicular scrapings; such procedure is justified in view of observations made on small, experiment animals. I think it is not any easier than the simple intramuscular transplantation.

The ligation of the vas deferens was mentioned by Dr. Dykstra. He did not mention that it is the so-called Steinach operation. It is a matter of great dispute, at present, in the German-speaking countries, as to whether the operation is of any value or not. There is ample evidence on both sides of the argument.

Dr. Ronsse mentioned the treatment of apparently sterile cows with ovarian extract. I do not wish to create the impression from my paper that transplantation is superior to the use of extracts. It is different. It is up to the practitioner to decide which he wishes to use. I believe both the transplantation and the use of tissue extracts are still in an experimental stage.

Dr. Hanna asked of what value are transplantation operations on bulls in which no spermatozoa can be found. I do not know that we are justified in making any claims. I think it worthy of trial. If the lack of spermatozoa is due to occlusion of any part of the ducts, transplantation is of no use, but if the lack of spermatozoa is due to dysfunction of testicular tissue, I believe it is worthy of trial.

Dr. Dykstra mentioned Lippincott's operation in caponizing. In that connection, I would like to mention again the operation of Morris, which

I described, in the transplantation of pieces of ovarian tissue from a woman to another woman from whom the ovaries had been completely removed. In my paper, I have given, as a footnote, the reference to that article in the *Medical Record*. Those of you who are interested in looking up that original article will be impressed with the great care which Morris took to see that every particle of ovarian tissue was first removed from the woman in whom he implanted the piece of ovary.

Dr. Fox asked regarding the possibliity of treatment of old bulls. I believe it would be worthy of experiment. The operation is very simple. Claims as to its value could not be made other than that experiments on small animals indicate that it may be of value.

Dr. Steel mentioned his observations in caponizing fowls in which there were slips in the operation, and pieces of ovarian tissue left in the fowl eliminated the effects of the castration. This is an observation which has been made by a great many people.

ONTARIO VETERINARY COLLEGE COMMENCEMENT

The Ontario Veterinary College held the annual commencement exercises and conversazione, November 13, 1925. Principal C. D. McGilvray acted as chairman and introduced the two leading speakers of the evening, Mayor George A. Drew, of Guelph, and Dr. F. C. Grenside, of the Faculty.

In giving a charge to the students of the College, Mayor Drew emphasized the need of faith in themselves, in the profession with which they were identified, and in their country. This he spoke of as one of the most important things they could carry away from college. They were what made life worth while, not the mere achievement.

Dr. Grenside discarded the subject that had been selected for him, "History of the Veterinary Profession in Ontario in the Past Fifty Years," in favor of one which, he said, he felt would have considerably more appeal to the ladies, "Fashions." He pleaded with the young ladies for just "two inches more of skirt." From an artistic standpoint, he felt that the dresses were too short. He also referred to the changes in riding habits from the long skirts and side-saddle days, to the present breeches and boots and astride riding. He infinitely preferred the side-saddle riding as more graceful.

One More

The speaker was enumerating in impassioned tones the evils of the day.

"What we want to do," he cried, "is to get rid of socialism, radicalism, bolshevism, communism, anarchism, and sovietism."

"And, while we're about it," chimed in a weather-beaten old man, "can we throw in rheumatism?"

BOVINE ABORTION—PREVENTION AND CONTROL—FURTHER REMARKS*

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Pennsylvania Bureau of Animal Industry

In preparing these few remarks on bovine infectious abortion the writer will attempt to continue along the same line of a paper presented before this section at the last annual meeting of the American Veterinary Medical Association and which was published in the April, 1925, number of the JOURNAL.

In the article referred to, bovine infectious abortion was dealt with from the standpoints of its importance; the use of vaccines; losses to infected herds; blood testing; elimination of reactors and the practice of sanitary measures; herd reports; and concluding remarks.

Under the part of the article dealing with herd reports the results obtained from blood testing, elimination of reactors and the practice of sanitary measures were given for the first four herds in which this plan was adopted. Herd 24 was reported more or less in detail.

Developments in these herds, since the last report, further encourages us to recommend the adoption of the principles involved in the Pennsylvania Plan for the Prevention, Repression and Eradication of Bovine Infectious Abortion. We have shown in previous articles that this is an economical procedure.

FIRST HERD (CONTINUED)

At the time of this writing there are 56 mature females in the first herd and, during the last year, 57 living calves were born which included two sets of twins. One cow was severely injured in the flank and aborted a 7½-months fetus, five weeks later. The right fetal placenta was much wrinkled, apparently thickened, very friable and of a dirty-brown color. This cow remained negative to blood tests. The placenta and fetus were studied culturally and by guinea pig inoculations, to determine the presence of the Bang bacillus, but with negative results. This is the only abortion which has occurred in the herd during the past four years, which is approximately one-half of one per cent. In the last test 92 animals of all ages were tested, with the result that all animals were negative.

*Presented at the sixty-second annual meeting of the Americen Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

While we have strongly advocated, and do still, the use of maternity stalls, in this particular herd cows are permitted to calve in the pasture field, in box stalls, or wherever they happen to be. This is not a good practice, but this herd has been used to demonstrate that if the Bang bacillus is eliminated, abortions are also eliminated. Extreme precautions are practiced in the addition of animals to the herd and protection from exposure to neighbors' cattle and, aside from this, no other precautions are used except that the herd is tested regularly, two to three times each year, and all reactors and animals showing suspicious symptoms are immediately removed. Only one reactor has been removed since 1921. At this time there are no sterile animals in the herd.

Second Herd (Continued)

The second herd at present maintains about 80 mature females. There have been no reactors, and no abortions have occurred during the last year. The herd has shown an average breeding efficiency between 90 and 100 per cent since work was begun in 1920. The owner is a strong advocate of the abortion blood-test and the principles of the Pennsylvania Plan.

Third Herd (Continued)

The following is a copy of a letter from the owner of the third herd, dated March 26, 1925:

> "I enclose you herewith our report on contagious abortion with supplemental schedules covering 1924.
>
> "I have nothing to add to the reading matter with the exception that I am more convinced than ever that it does not pay to keep reactors, and that I would not think of breeding or try to raise cattle unless they were blood tested for contagious abortion, and the herd kept on a contagious abortion schedule similar to the rules and regulations as set for tuberculosis."
>
> (Signed) A. A. Thompson.

The supplemental schedule shows, for the year 1924, 27 per cent breeding efficiency in the reacting herd as against 85 per cent in the clean herd. In 1923 the reacting herd showed 41 per cent breeding efficiency as against 100 per cent in the clean herd.

Fourth Herd

A final report was shown for the fourth herd in last year's article.

Herd 24 (Continued)

Results in herd 24 have been very encouraging. It is aimed to maintain 100 mature females in this herd. At the time of the

Note: For the reader to understand thoroughly the herd reports contained in this article, he should refer to the previous article (Journal A. V. M. A. lxvii (1925), n. s. 20 (1), p. 54).

report a year ago 50 per cent of 100 animals had been removed from the herd as reactors to the abortion blood-test. These were replaced by young stock which had grown to maturity. Since the 1924 report, tests have been applied every two to three months. During the year, two animals have aborted, but fortunately were isolated before the abortions occurred. These two animals reacted to the test, one previous to aborting and the other not until after she had aborted and were immediately removed from the herd. No reactors were removed on the last two tests.

Work was begun in this herd when the number of abortions was on the increase—the disease was rapidly progressing. The proper time to have begun would have been when the disease was apparently at a standstill. No abortions had occurred in the herd from 1918 until September, 1922. Had the owner begun practice of the principles he is now practicing, at the time a test was applied to 41 animals in May, 1921, the first cow to abort in 1922 would not have been in the herd and following troubles would undoubtedly have been prevented.

The owner of this herd, in addressing a group of veterinarians, stated that he had been in the cattle-breeding business since 1880, and during this time had had various ups and downs, had suffered large losses from abortion, and just about the time he thought they were rid of it, it cropped out again and a high percentage of the cattle aborted. The process was repeated every few years. He finally decided that unless he could eliminate abortion he would start another business. He stated that tuberculosis is more important to the consumer but that the producer suffers more from abortion. He further stated that he felt confident that clean herds can be established, and to keep in the dairy business with an infected herd means bankruptcy. He stated further that it is largely in the hands of the veterinary profession to determine what shall be successful dairying in the future.

The superintendent's acurate record of the breeding data for 99 mature females, which comprised the herd from July 1, 1924, to July 1, 1925, is shown as follows:

Ninety cows, or approximately 91 per cent, gave birth to normal, full-time calves within the 12-months period, July 1, 1924, to July 1, 1925.

Three cows, or approximately 3 per cent, aborted and also reacted to the abortion blood-test and, in each case, *Bacillus abortus* Bang was demonstrated in the fetus. These three cows

were immediately removed from the herd. One of the three was reported in the 1924 report, which leaves only two since that report was given.

One cow gave birth to dead twins at 260 days. This cow has never reacted to the abortion blood-test. The placenta and dead calves were studied culturally and by guinea pig inoculations, for the presence of *Bacillus abortus* Bang, with negative results. We believe that the death of these calves was due to injury, since their body cavities were full of blood, a condition which has been previously found where there was considerable evidence of abortions as a result of injury.

One cow gave birth to her last calf September 27, 1923, and has been sterile since. This is the only sterile cow in the herd at the present time.

The four other cows necessary to make a total of 99 are accounted for as follows:

1 cow calved 11-15-23 and is due to calve again 8-28-25.
1 cow calved 3-3-24 and is due to calve again 9-29-25.
1 cow calved 6-2-24 and is due to calve again 8-29-25.
1 cow calved 6-23-24 and is due to calve again 11-6-25.

Remarks: In determining the breeding efficiency of herds, possibly more than twelve months should be allowed for individual animals, since conditions other than diseases of the genital organs may sometimes be accountable for cows not giving birth to a calf within any given twelve-month period. Two of the above cows calved normally just previous to July 1, 1924. One of the others is due again in August, and the other in November, 1925, which is 14 months for one and 16 for the other, from one calving period until the next. One cow will show a period of 18 months between calves and the fourth one 21 months. Include the last four cows and we have a breeding efficiency in this herd of 95 per cent.

Other Herds

Our work has not been limited to the few herds reported above. These are used as examples and as a continuance of last year's report. The results obtained during the last year further demonstrate the soundness of the principles involved in this practice.

Many practicing veterinarians have taken up the work cooperatively with the Bureau and it is being carried out in herds in most every section of the State. A bull club boasts of being abortion-free. A group of herd owners in one section of the State have voluntarily subjected their herds to test on an area basis, and are now considering it for a township.

In the concluding remarks of the 1924 article the Pennsylvania Plan was referred to. This plan was prepared in December, 1921, and was revised in December, 1924. It is shown below in revised form.

The Pennsylvania Plan for the Prevention, Repression and Eradication of Bovine Infectious Abortion

Made December 1, 1921—Revised December 1, 1924.

The Bureau of Animal Industry, Pennsylvania Department of Agriculture (formerly the Pennsylvania State Live Stock Sanitary Board), ever since its organization, has studied the disease of cattle known as "bovine infectious abortion," always with the hope that suitable methods for its prevention and repression would be devised.

Soon after 1896, when Professor Bang discovered the cause of infectious abortion, Pearson outlined some principles for its control which were dependent upon isolation, sanitation and disinfection. With the foundation already laid, an increasing study has added much to the knowledge of the nature of this disease, thus making possible the employment of more effective methods of prevention and control.

In November of 1919, the officials of the Bureau of Animal Industry, Pennsylvania Department of Agriculture, conceived the idea of establishing a health standard with respect to bovine infectious abortion. The adoption of such a standard would benefit the live stock in several ways:

1. Improve the quality of the herd. Increase the quantity and decrease the cost of production.
2. Would stimulate stockmen to establish abortion-free herds.
3. Provide a safe place for prospective purchasers to obtain new animals.

A certificate will be issued to herds under Bureau supervision which have qualified.

The following is a copy of the first certificate, which was issued December 16, 1921:

Certificate of Inspection and Test for Bovine Infectious Abortion

Certificate No..... Issued.....192..
This is to certify that the entire herd of.....
of.....P. O.....County, Pennsylvania,
consisting of ..... cattle has undergone inspection; has passed the required number of blood tests; the owner has complied with the require-

ments prescribed by the Pennsylvania Bureau of Animal Industry for the prevention, repression and eradication of Bovine Infections Abortion; and the history indicates the absence of infection with Bovine Infectious Abortion.

The above mentioned animals have been found free from all evidence of Bovine Infectious Abortion and are approved by the Bureau.

This certificate is good for one year from date issued unless revoked.

.....

State Veterinarian.

Outline of Plan

(1) An abortion-free, approved herd under the Pennsylvania Plan is one in which no evidence of bovine infectious abortion has been shown and in which no reactors to the abortion blood-test have been found over a period of at least one year.

(2) The owner must place his herd under supervision of the Bureau of Animal Industry, Pennsylvania Department of Agriculture, for the prevention, repression and eradication of bovine infectious abortion.

(3) The history is obtained and blood is collected from the entire herd by the Pennsylvania Bureau of Animal Industry or under its supervision and tested by said Bureau.

(4) A list of cattle tested shall be supplied the Bureau at each time a test is applied so that each blood sample can be identified by the name of the cow, tattoo or ear-tag number.

(5) In a herd in which there are reactors to the first test, all reacting animals shall be either placed on a separate farm and will be known as the "Infected Herd," or shall be disposed of in a manner satisfactory to the Bureau of Animal Industry. The animals which pass the test, if separated from the reactors, shall be known as the "Clean Herd."

(6) In a herd in which reactors are found, as described in section 5, a retest must be applied to the clean herd in at least 60 days subsequent to the date of first test, and additional reactors must immediately be placed in the infected herd or disposed of as provided in section 5.

(7) The clean herd shall be tested at such intervals as deemed advisable by the Pennsylvania Bureau but in no case shall there be a period of more than one year between tests. If additional reactors are found they shall be handled as provided in Section 5. Animals from the infected herd which do not show a reaction may be placed in isolation and retested in 60 days, and if they pass the retest may be placed in the clean herd provided section 12 is adhered to. Individual animals shall be subjected to such test or tests and at such intervals as the Bureau of Animal

Industry deems advisable for the effectual working of the plan.

(8) Herd bulls must not be used for service to cattle in other herds.

(9) All milk and other dairy products fed shall be either produced by an approved herd or shall be properly pasteurized.

(10) Cattle from approved herds may be added without test. If shipped, the car must be cleaned and disinfected, and public stock-yards must be avoided.

(11) All cattle to be added, other than those from approved herds, must have passed a blood test approved by the Bureau of Animal Industry, must be isolated for a period of at least 60 days, and must have passed the second test applied in accordance with section 3.

(12) In no case shall pregnant animals be added to a clean herd, unless coming from an approved, abortion-free herd. Pregnant animals, other than those from approved, abortion-free herds, to be added, must be isolated until after having calved and must have passed a blood test not within two weeks after having calved.

(13) Cattle removed from the farm for exhibition or any other purpose shall be provided with separate quarters and shall not be exposed to cattle other than those from approved, abortion-free herds. If shipped, section 10 must be complied with.

(14) Any animal which aborts in any herd under supervision must be immediately isolated and reported to the Bureau of Animal Industry. The place where the abortion occurred must be immediately cleaned and disinfected; the fetus and membranes must be properly disposed of.

(15) The premises must be in a sanitary condition. After the removal of affected animals the stable must be cleaned and disinfected under official supervision.

(16) No herd will be placed under supervision, the owner of which is not practicing measures against tuberculosis.

(17) The work of the Bureau of Animal Industry will be conducted cooperatively with the owner and his veterinarians.

(18) A certificate will be issued to herds in which no reactors have been found over a period of one year and which the history indicates are free from this disease, provided the above requirements have been complied with and the following agreement has been properly signed and executed.

AGREEMENT OF OWNER WITH THE BUREAU OF ANIMAL INDUSTRY, PENNSYLVANIA DEPARTMENT OF AGRICULTURE

I hereby agree to the terms of the above plan for the prevention, repression and eradication of Bovine Infectious Abortion. I also agree to observe and fulfill the foregoing requirements. And I agree further: The failure on my part to comply with the foregoing shall be sufficient cause for cancellation of this agreement.

My herd consists of the following cattle:

	Purebred	Grades	Total
Females over 1 year of age			
Females under 1 year of age			
Males over 1 year of age			
Males under 1 year of age			
Total			

Predominating Breed.....

Date..... Owner.....

Witness..... Address.....

ESSENTIALS

Whether one's aim is to control and suppress bovine infectious abortion through the adoption of the Pennsylvania Plan or some other plan, based on the principles contained in the Pennsylvania Plan, there are certain essentials necessary in obtaining the best results. In some herds the percentage of reactors is so high that to adopt the Pennsylvania Plan would require that most all animals be taken out of the herd. In this case it is doubtful if the adoption of the plan in its entirety would be advisable. On the contrary it might be advisable to consider the entire herd infected and depend upon its offspring for building up a herd free from bovine infectious abortion and eventually incorporating into this free herd the animals from the original herd which show repeated negative readings to the blood test. The further aim then should be finally to dispose of the original reacting herd.

It does not matter what method is adopted for the control of this disease, the future aim should be eventually to eradicate infectious abortion. With this aim in view, it will be more quickly accomplished by observing the following principles:

1. Improvements in blood lines should be made as much as possible by careful selection within the herd rather than from outside sources, thus excluding outside infection.

2. There should be provided a separate stable, known as a maternity barn, for cows at calving time. This stable should be so constructed that it can be easily and thoroughly disinfected, or better, fumigated with formaldehyde. On farms containing a large number of cows it should have a sufficient number of completely separated stalls to accommodate the number of cows that would be calving at one time.

3. Every cow should be removed from the herd and placed in the maternity stable at calving time. Cows showing symptoms of abortion should be placed either in the maternity stable, or in a hospital stable, maintained especially for the purpose of animals showing evidence of disease. All cows placed in the maternity stable should be kept there until all discharges following calving have ceased.

4. All afterbirths and aborted or dead calves should be carried in a non-leakable container to a suitable place and should be well buried or burned immediately.

5. The maternity stall should be well cleaned and effectively disinfected or preferably fumigated before another cow goes into it. The manure and litter should not be placed in the exercise or feed-yard.

6. The herdsman should observe all pregnant animals daily and should remove suspicious animals from the herd before any considerable damage has been done.

7. In case an abortion has occurred in a stable the cow should be immediately isolated, the fetus and membranes should be carried in a proper container to a suitable place and burned or buried, and the stable should be well cleaned and disinfected. An abortion occurring in the pasture field should be handled the same way. The earth at the point where the abortion occurred should be covered with three or four inches of lime, or a strong disinfectant, or both.

8. Every case of abortion should be considered infectious until otherwise determined.

9. Feed should be obtained from such sources and should be so stored that it will be insured against contamination with disease-producing organisms.

10. Manure piles should not be stored in the exercise or feed-yards. There should be no barnyard manure pile. No cow should have access to manure piles at any time.

11. Bull clubs should be considered as consisting of units and handled as individual herds. Members of bull clubs should exercise extreme precautions, as pertain to abortion and other transmissible diseases.

12. Herd bulls should not be used for service to neighbors' cows.

13. If purchases are to be made, the history of the herd from which one wishes to purchase and the individual animal history should be determined and if either is doubtful the purchase

should not be made until the animal's health is definitely determined, and even then it is safer to purchase from healthy herds.

14. Pregnant animals should not be purchased unless isolated, until they have given birth to a calf, have passed a satisfactory blood test not within two weeks after having calved, and the discharges following calving have ceased.

15. No person should be permitted to inject a vaccine or serum to prevent abortion unless it has the stamp of approval of the state official charged with the prevention, control and repression of transmissible animal diseases in the state. Abortion vaccines and bacterins will cause animals to react and should not be used in herds where testing is being done.

16. No animals susceptible to this disease should have access to neighbors' animals. All animals under supervision should be protected from neighbors' animals in such a way that there is no communication whatever.

17. The blood test should be applied at frequent intervals, and all reactors, both male and female, immediately removed, until all remaining animals have passed several consecutive tests.

18. Every reactor should be considered a carrier and every carrier should be considered a spreader.

19. Every cow in the herd should be considered a spreader at calving time, until no reactors have been found over a period of at least one year.

20. Reacting animals possessing little value from a breeding standpoint, or when unprofitable, should be disposed of.

21. The value of animals of high merit warrants keeping them separate, in order that the breeder may be benefited by their blood lines obtained in offspring.

22. It is much easier to keep herds free from bovine infectious abortion than to establish free herds from those which have once become infected.

23. Prevention of disease is much more economical and more effective than cures.

24. Veterinarians, breeders and herdsmen should be slow in becoming discouraged when attempting, by proper measures, to eliminate abortion infection from the herd.

25. Remember that it took some of our most modern live stock owners almost thirty years to understand that it is more profitable to maintain herds free from tuberculosis by the adoption of proper preventive and control measures than to maintain diseased

herds. So will it take time for them to understand that it is more economical to keep herds free from bovine infectious abortion.

Concluding Remarks

In conclusion the writer wishes to urge upon veterinarians the importance of bovine infectious abortion in relation to the economic production of cattle, beef and milk.

Bang bacillus disease would seem a more appropriate name, for the reason that it would imply a disease caused by the Bang bacillus, regardless of species and sex. The name bovine infectious abortion is inappropriate for the reason that swine are not bovines and bulls do not abort.

Veterinarians are confronted, almost every day, with opportunities to use their influence in establishing herds on a healthy basis. Many herds are completely wiped out on account of tuberculosis and the tuberculin test. Why not reestablish these herds free from abortion as well as tuberculosis? The percentage of young stock infected with Bang bacillus disease is much lower than other classes and can be purchased much cheaper than mature animals. They are also less likely to be infected with tuberculosis and other diseases.

The veterinary profession could render breeders no greater service than to eradicate bovine infectious abortion.

Discussion

Dr. N. F. Williams: This disease is spread throughout the country, no part being without its share of the infection. This paper is especially interesting to me in that it holds a brighter hope for the work and seems to present a systematic outline for eradicating the disease. At the same time, I want to call your attention to what I consider an imposition, by three states, on other states, unless the incentive that caused their action was the fact that they were conducting within their own states some systematic attempt at eradication of this disease. Those states are Arkansas, Georgia and South Carolina, and they are requiring serological tests on cattle going into those states. Unless those states are far advanced in the systematic eradication of this disease through regulations, they are not warranted in this action. There is no benefit derived from cattle that are leaving this state for one of those states, on a chart that is augmented by the serological test showing them to be free from infection. Those animals are more susceptible to pick up the organisms when they reach those states and are more of a menace to the owner's herd. Unless we give consideration to those problems and their solution, we are going to defeat the good that the veterinary profession could do; in other words, we are not selling ourselves to the stock-raising interests who most depend upon our advice and counsel for their aid.

Dr. Hadleigh Marsh: What is the best method of cleaning and disinfecting to make a clean herd? When do you consider it safe to introduce non-reacting cattle into a safe herd?

Dr. Stubbs: I am not in a position to discuss this problem very satisfactorily, although I am acquainted with the work Dr. Barnes is doing. I would not feel free to say how soon after. So far as I know, there has been no recommendation along that line. In regard to sanitation, I think a free,

clean premises may be obtained in about the same way as is used or recommended for tuberculosis.

DR. R. J. DONOHUE: Are they using vaccines or live cultures in badly-infected herds under the Pennsylvania plan?

DR. STUBBS: I am sorry that I cannot give an answer to that question. Dr. Barnes reported last year on the use of living-culture vaccines, on infected herds, in Pennsylvania, in an experimental way. So far as I know, they consider that vaccines for abortion are experimental. They were not able to see any good results obtained so far as I know.

DR. E. R. DERFLINGER: How many tests should be applied before you place a non-reactor into what you call a free herd? How many tests should you give this animal before you feel that the animal is clear, unless you are definitely acquainted with the animal and the herds in the community?

DR. STUBBS: I am not in a position to answer that question.

DR. N. F. WILLIAMS: I have understood that in one year, in a herd of one hundred head, fifty of them were removed and replaced with fifty others. Were those fifty free from infection?

DR. STUBBS: I cannot say definitely, but I am sure they were.

DR. E. A. CAHILL: In Pennsylvania, they have done remarkable work and we are all indebted to Dr. Barnes for what he has shown us. However, in considering this plan, two facts should be kept in mind.

After all, this system is not particularly different from the Bang system, which has proved impracticable for an ordinary herd. A few herds may be using it, but for the average farmer it is not a practicable way of controlling the disease. Many control plans not practical for the practitioner may be successful under state control, if the right men are in charge of the work, and they have the cooperation of the owners. But I do not see how this method of control could apply to an ordinary herd, in the practice of an ordinary veterinarian, who is being called upon every day to control abortion. The other thought in my mind is this: There must be a great many cases in Pennsylvania unless it is different from the other parts of the country, where new animals are introduced into herds, give a negative test or two, and still those animals will abort. It is generally accepted throughout the country that a serological test is not a good individual index. The test may be all right as a herd index, but it is not dependable in individual cases.

We know from practical experience and from letters and complaints that no matter how efficiently it may be applied, the test result differs from the history of the animal in many cases. You will remember that Dr. Fitch, in an effort to determine the accuracy of this test, sent a number of samples to twelve different laboratories, and that the results differed to some extent. I do not see how the individual practitioner, not affiliated with the state, is in a position to eradicate or control this disease along lines laid down by Dr. Barnes, even though it is applicable as a state control plan.

Almost any disease can be controlled in the latter, but for the ordinary average grade herd, upon which the practitioner is depending for his living, it is not practical—at least until we have a more dependable diagnostic test than we have at the present time. (Applause)

DR. W. T. JOHNSON: Has anything been done to determine the life of the Bang bacillus in a manure pile?

DR. STUBBS: I cannot answer that question. There are doubtless many men in the room who are familiar with the literature and better qualified to give an opinion upon that subject than I am.

A VOICE: With reference to the gentleman from Indiana,—we are quite willing to admit that the agglutination test is not always dependable. It seems to me that the varying reports received in connection with the twelve samples show that it is a test of individuals and not of herds.

A VOICE: Yesterday, in another section, Drs. Simms and Miller mentioned, in discussing their paper, a condition which exists where animals have given a positive test and are known to be infected, but just previous to abortion they gave a negative test. Supposing I am the owner of a herd being tested along this line; I buy a cow which gives a negative report; she is introduced into the herd and aborts. We have any number of reports and records in the labora-

tory from practitioners sending in samples of blood showing a negative test and the cow's history is diametrically opposite. Dr. Fitch himself was not able to explain why it happened. I would rather say, as an individual test, I do not believe anybody is going to go on record that it is of a positive character.

COMMENTS BY DR. BARNES

In discussing my paper Dr. Williams criticized the officials of Georgia, South Carolina and Arkansas for regulating against importation of cattle from other states except on serological test. It is understood that there is only a small amount of infection in these three states and the state officials certainly are justified in protecting these states from the further introduction of infection. Because a cow has passed the abortion blood-test does not make her more susceptible to the disease, and if a cow free from this disease is taken into the state and placed in a clean herd there is no danger that she will act either as a center of infection or contract the disease. There is no doubt that the officials in these states are encouraging the owners of infected herds along lines of eradication. Voluntary consent of these owners to rid their herds of infectious abortion is much better than to attempt to regulate them into doing it.

In reply to Dr. Donahue's questions relative to vaccines, it might be stated that vaccines are contraindicated and, under the heading "Essentials," it is specifically stated that they must not be used, as they will cause animals to react to the blood test.

Dr. Derflinger's question is answered in the "plan." Pregnant animals should not be added until after having calved and passed the blood test two weeks subsequent thereto. Open animals may be added on two negative tests with a sixty-day interval.

In reply to Dr. Williams' second question, there would be no object in adding diseased animals to a herd from which one is attempting to eradicate disease.

In reference to Dr. Cahill's discussion, the writer wishes to state that the Pennsylvania abortion plan is very much different from the Bang System. The plan permits, however, that diseased animals be kept in separate quarters, but it is preferable and more profitable to dispose of reactors. Cows fed on unpasteurized milk from tuberculous cows become permanently infected with tuberculosis. Quite a number of calves fed on milk from abortion-reacting cows become reactors to the abortion blood-test, and some of them become permanently infected with the Bang bacillus; but a large majority cease to react before they have reached six months of age.

If systematically carried out, the abortion plan is both practicable and profitable, and more noticeably so with the ordinary farmer than with the cattle breeder who is not dependent upon his cattle for a livelihood. Disease eradication measures are much more easily carried out on the basis of small units than on a large scale. A farmer would better consume a little more time in building a herd on a solid foundation than to have the value of his herd consumed every few years as a result of abortion infection.

Dr. Cahill speaks of the "ordinary" veterinarian. Too many of us are in the "ordinary" class and apparently want to stay there, but by doing so it is not possible for us to render our clients the kind of service they have a right to demand. The writer is not familiar with any system whereby bovine infectious abortion has been eradicated, except the system of blood testing and disposal of reactors in conjunction with the practice of sanitary measures. The practice of sanitary measures is basic to the best known methods of prevention, control and eradication of this disease. The Pennsylvania Plan contains such principles and its proper execution has eradicated bovine infectious abortion from a number of herds.

A few cases are known in Pennsylvania where animals introduced on a negative test or two have aborted. In these cases the recommendations in the plan were not carried out. The plan warns against adding pregnant animals. No trouble has occurred when this precaution has been followed as advised in the plan. Those who have employed the test most extensively do not consider it an index as to whether an animal will abort or not. It is only the "ordinary" veterinarian who expects the results of the test to agree with the visible history of the animal. Experienced and broad-minded veterinarians do not

expect all animals which react to the tuberculin test to manifest symptoms of tuberculosis or die of that disease.

What is practicable under state control should be practicable under private control. One of the most difficult parts of carrying out the abortion plan is to get animals properly identified. In Pennsylvania we aim to carry out the plan in a few herds through the cooperation of the state control and the practicing veterinarian. The owner volunteers his herd.

(*Note:* Dr. Barnes' paper was read by Dr. E. L. Stubbs and, as the latter was not sufficiently familiar with Dr. Barnes' experiments to give full answers to all of the questions asked, the discussion was sent to Dr. Barnes with the request that he prepare answers to the specific questions asked by those who participated in the discussion of the paper.—EDITOR.)

HEMORRHAGIC SEPTICEMIA AGGRESSIN

Further studies of hemorrhagic septicemia aggressin were made. Earlier experiments had shown that this product is capable of producing a high-grade immunity against hemorrhagic septicemia of domestic animals. The studies of the past year provided the additional information that animals treated with hemorrhagic septicemia aggressin acquire an increased resistance to infection at a very early date. Animals so treated were found to be immune to artificail exposure as early as four days after vaccination, whereas animals treated with hemorrhagic septicemia bacterin in the same experiments were immune only after the ninth day. Aggressin-treated cattle were further found to be still resistant to infection fifteen months after vaccination. The rapidity with which the immunity is produced, together with its long duration, warrants the conclusion that hemorrhagic septicemia aggressin is a valuable veterinary biological product. Its production on a commercial scale seems to be practicable. (Report of Chief of Bureau of Animal Industry, 1925.)

CLEVELAND HOLDS STOCK SHOW

The first annual Cleveland Live Stock Show was held at the Cleveland (Ohio) Union Stockyards, December 9-10, 1925. The show was promoted largely through the efforts of the Committee on Agricultural Development of the Cleveland Chamber of Commerce. Dr. A. S. Cooley, former state veterinarian of Ohio and member of the Ohio House of Representatives, is a member of the Committee. One of the features of the show was the sale of the grand champion steer, at $3.05 per pound, beating the record of $3.00 per pound paid for the grand champion steer at the International Live Stock Show, in Chicago, the week previous. The Cleveland champion was only a yearling calf, while the Chicago steer was a two-year-old.

CASE REPORTS ON THE USE OF OESTRUAL HORMONE AND OTHER GLAND EXTRACTS IN THE TREATMENT OF FUNCTIONAL STERILITY*
(Seventh Report)

By H. S. MURPHEY, G. W. MCNUTT, B. A. ZUPP *and* W. A. AITKEN

Department of Anatomy, Iowa State College, Ames, Iowa

In previous papers[1,2,3] we have outlined the methods used in a study planned to build a norm for the reproductive phenomena of the cow. During the past year our studies have continued as outlined at the Des Moines meeting.[3] Our results summarized are:

1. The cyclic functioning of the ovary is dependent, in part, on the cyclic functioning of the tubular part of the genitalia.[4]
2. The cyclic functioning of the tubular part of the genitalia depends in part on stimulation derived from the oestrual hormone of the follicular fluid. (See case reports.)
3. In previous papers we have indicated our working hypothesis in the use of corpus luteum extract.
4. The additional factors necessary are not known to us except as noted previously.[1,2,3]

We have called all cases "functional sterility" in which no abnormalities could be detected by rectal palpation or by the use of the tubular vaginal speculum. We now know that some of these show enough disease of the mucous membrane to prevent the development of a normal maternal placenta; in others we have found disease of the hypophysis cerebri (pituitary body), etc.

Our other endocrine gland extracts have not progressed far enough to say whether or not they produce specific substances necessary for the reproductive phenomena, even though we are encouraged to further study.

Ovarian grafts in the female and testicular grafts and testicular extracts in the male are being tried out in sterile and impotent cases respectively, in conjunction with the clinic staff.

We are indebted to Drs. H. E. Bemis, C. H. Covault, and F. E. Walsh for an accurate diagnosis and an opportunity to treat the most of the cases recorded in this report.

*Presented at the sixty-second annual meeting of the American Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

We have had many failures, but 60 per cent were successes—which we think encouraging in view of the fact that otherwise these animals would all go to the block, even though some might have conceived without any treatment.

All of these cases were selected because there was no other line of treatment available.

Oestrous Cycle. Dog Ex. 7

A seven-year-old English bull bitch came to our attention, March 1, 1925, with a history of having raised two litters. She had been bred again in December, 1924, but had not conceived. Owner decided that if possible he would like to have her brought into heat sooner than she would naturally come in.

She was treated with oestrual hormone prepared from bovine ovaries. From March 10th to 17th, she was injected subcutaneously with one-fourth dose of oestrual hormone daily. From the 17th to 19th, the dose was increased to two-fifths of a dose and from the 19th to 22nd, the dosage was increased to one dose daily.

On March 26 she was injected intraperitoneally with the liquor folliculi taken directly from the ovaries of a bitch in heat. On March 27 she received, in the same manner, the liquor folliculi taken directly from the ovaries of a bitch in which ovulation had occurred in all but one follicle, and on April 7 the liquor folliculi taken directly from the ovaries of a bitch just coming into heat.

On April 20 this bitch was discharged, as no apparent results had been obtained. It was thought that she might come into heat of her own accord, but up to July 17 there had been no signs of heat.

Oestrous Cycle. Ox Ex. 10

A Holstein cow, born March, 1921. During her first pregnancy she aborted on November 7, 1922, and following this abortion she developed a genital discharge and became markedly emaciated. She did not regain a breeding condition until in April, 1923, being bred on the 27th. She did not conceive, but came into heat regularly. When examined on June 27, 1923, oestrual hormone treatment was advised. She was in heat again on July 18, and on August 6, or nineteen days later, she was injected intravenously with one dose of oestrual hormone. Her next heat came on August 12. On August 30, or eighteen days

after heat, she was injected again, and she came into heat and was bred on September 1.

When examined on November 14 she was thought to be pregnant, but when re-examined on January 3, 1924, she was found not pregnant. At this time a corpus luteum was removed from one of the ovaries. She then came in heat twice and was bred on May 22. When examined on July 17 she was diagnosed pregnant. November 11, not pregannt. (See statement regarding diseased mucous membrane, in introduction.)

Oestrous Cycle. Ox Ex. 21

A three-year-old Jersey cow, with a history that she came into heat regularly but would not conceive. She showed a rough hair coat, was coarse over the withers and also showed patchy fat throughout the subcutis.

When examined, the entire genitalia was found in good condition except the central fold of the cervix, which was slightly congested.

She was in heat on October 28, 1924, and on the twenty-ninth she ovulated from the left ovary. The uterus was not typically a uterus of oestrus as it felt leathery and a trifle atonic. Following this she developed a slight muco-purulent discharge which was treated by irrigating several times with a warm one-half per cent solution of therapogen. On December 22 she was in heat and bred.

At this time the uterus felt typical of oestrus. She did not conceive from this service and was in heat again on February 7, 1925, but was not bred. On February 25, or eighteen days after her previous heat, she was injected intravenously with one dose of oestrual hormone. At this time the central fold of the cervix was larger than before and still congested.

On March 2 she was in heat again and, as owner desired to use his own herd bull, the case was discharged on March 7 and owner advised to breed on next heat period, which he did and reported on July 16, 1925, that she had not been in heat since and was satisfied that she was pregnant.

Oestrous Cycle. Ox Ex. 29

A three-year-old Jersey cow had been under the local veterinarian's treatment for some time, with no results. The owner did not care to spend any more time and money for treatment so he sold her to the local veterinarian, who injected her intra-

venously with one dose of oestrual hormone on the eighteenth day after her previous heat period and then bred at the next heat. On June 3, 1925, he reported she had passed two heat periods, and on July 17 reported her pregnant.

Oestrous Cycle. Ox Ex. 30

A four-year-old Jersey cow came to our attention on March 22, 1925, with a history that she had been bred twelve times previously, with no results. The local veterinarian had examined her twice. On the first examination he found the left ovary diseased and the right ovary normal; on the second examination both ovaries seemed functionless, although no disease was apparent.

On March 27 two old corpora lutea were expelled from the right ovary. Following the removal of these bodies, it was thought that the ovaries would function, but on April 15, both ovaries were firm and fibrous, and no follicles were found.

From May 4 to May 24, 1925, inclusive, she was daily injected with one dose of oestrual hormone, intravenously, and on June 1 she was in heat and bred. On July 17, 1925, she was diagnosed pregnant.

Oestrous Cycle. Ox Ex. 24

An eleven-year-old Shorthorn cow was sent to the clinic to be treated for sterility. Her last calf was dropped in December, 1922. Since that time she had been bred a number of times, to different bulls, but with no results. There was no history of abortion. She came into heat regularly. The local veterinarian treated the case with no apparent results.

When first examined on March 9, 1924, she showed a slightly hypertrophied cervix and some cervicitis. The cervicitis was treated with Lugol's solution to which it responded readily. She showed no external signs of heat, although the organs functioned normally, as determined by vaginal and rectal examinations. On April 21, a corpus luteum was expressed from the left ovary, but this failed to bring on a heat period.

On June 1 both ovaries were small and functionless, but the tubular part of the tract was in good condition. At this time oestrual hormone was advised, and two doses were injected intravenously, followed by another dose the next day.

On June 3 the right ovary contained a follicle about 9 or 10 m.m. in diameter, the left ovary was small as before. When the tract was examined with the tubular vaginal speculum, it showed

considerable congestion and a marked increase in the amount of secretion, which was clear and normal for heat.

On June 4 it was found that ovulation had already taken place from the right ovary and that by careful palpation the developing corpus luteum could be felt. The left ovary showed no change. The uterus was erect, but not quite typical of oestrus. When the speculum was passed, the tract did not appear as moist as on the day previous, but the secretion was more adhesive and contained considerable blood. The mucous membrane was congested.

On June 23 the cow came into heat, but it was a rather mild period, as she had to be confined when bred. She did not conceive, but was back in heat on July 25, very much excited, and bred with no difficulty. On August 21 she was diagnosed pregnant.

Oestrous Cycle. Ox Ex. 33

A grade Holstein cow dropped a calf on December 15, 1923, and had shown no heat since. When examined on July 17, 1924, the genital organs were normal, except that the ovaries seemed functionless. A diagnosis of functional sterility of ovarian origin was made. On July 20 she was re-examined and the original diagnosis confirmed. On this date she was injected intravenously with one dose of oestrual hormone. She did not come into heat until August 11, when she was bred. She was in heat again on August 19, but not bred. She came back into heat and was bred September 8. On November 7 she was diagnosed pregnant.

Oestrous Cycle. Ox Ex. 17

An eleven-year-old cow, had calved about three years ago and had not conceived since. About a year ago she had a cervicitis which was treated several times with little or no results. She had been in heat and bred several times since she had the last calf. On July 9, 1923, she was given one dose of oestrual hormone, again on August 3, and was bred on August 5. She was in heat again about the middle of August. The corpus luteum of this ovulation was retained.

Upon rectal palpation, nothing abnormal could be found. The tract was slightly to the right of the median plane and the cervix was rather firm. There was not much change in the ovaries from time to time.

Animal was slaughtered on January 13, 1924.

POSTMORTEM FINDINGS

Vestibule: Yellowish, slightly gelatinous, showing many lymph-vessels and blood capillaries.

Vagina: Slightly inflamed, mucous membrane thickened.

Cervix: Outer ring of folds too large and too long. Second fold showing through outer ring, inflamed and showing petechiae. Fibrosis of outer folds. Mucus in cervix too heavy, very tenacious. Third fold shows some overgrowth, also small, white elevations and atrophic folds.

Uterus: Wall varying from 9 to 11 m.m. Surface of mucous membrane has a dirty, muddy, gelatinous appearance and the same type of tissue covers the cotyledonary area. Cotyledons show radiating white lines. (It would not develop a maternal placenta.)

Right ovary: Fibrous, shows some follicles.

Left ovary: 41 x 25 x 20 m.m. and had a retained corpus luteum in it that measured 25 x 22 x 20 m.m.

OESTROUS CYCLE. OX EX. 19

A pure-bred Guernsey cow had aborted near the end of her first pregnancy and a metritis followed. Also two quarters of her udder were destroyed by abscesses. Owner did not notice her in heat until after the udder had healed.

Near the end of her second term of pregnancy she aborted again and this time developed a metritis and cervicitis which was treated with Lugol's solution once a week for four weeks, then allowed to rest for four weeks, when the treatment was repeated. After a few more weeks of rest she was bred, but did not conceive.

On October 9, 1924, she was in heat but not bred. On October 27, or eighteen days after her last heat period, she was injected intravenously with two doses of oestrual hormone, and she was in heat but not bred on October 29. Then, on November 16, 17, and 18, she received one dose each day. On November 22 was in heat and bred. She was not in heat again until January 2, 1925. Unfortunately this cow was sold to a shipper, but we suspect that she was an aborter, due to an inability to develop a normal maternal placenta.

OESTROUS CYCLE. OX EX. 2

An eight-year-old Holstein cow, that had been on official butter-fat test as a two-year-old, dropped a calf in September, 1920, and began to show signs of nymphomania in October of the same year. Cysts were periodically expelled from the ovaries until February, 1924. From February 27 to March 10, she was injected intravenously with one dose of oestrual hormone daily. On March 8 she was discharging a small amount of slightly cloudy mucus. Vaginal smears on this date showed a few epithelial cells, mostly cornified, and a large number of normal leucocytes.

February 14, examination revealed some small clots of light yellowish-white material in the vagina; tract slightly congested; cervix slightly patchy and discharging a small amount of clear mucus; the goblet cells were filled. Smears looked like those from about the middle of the cycle.

On April 17 the cow was in heat. A small cyst or follicle in the left ovary; cervix and vagina were normal, but the mucus present was gummy and somewhat cloudy. On April 21 four cysts were expelled from the ovaries. On the 23rd she still showed some signs of heat.

Beginning January 14, 1925, she was injected intravenously with one dose of extract of corpus luteum daily until March 5. January 26 two follicles were present in the right ovary and a cyst was aspirated per vaginam from the left ovary. February 12 a small cyst broke in the left ovary when palpated. Nothing was found in the right ovary.

On March 11 there was a medium-size cyst in the right ovary and a small one in the left ovary.

On April 30 the cow was killed at the abattoir. The subcutaneous fat was patchy and uneven. Bones were very hard to saw or split with a cleaver.

Ovaries: The left ovary was the smaller of the two. It contained one large and several small cysts. Walls of cysts appeared shiny. One cyst (about 20 m.m.) appeared darker in color than the others. All cysts were filled with a bloody fluid. One corpus luteum, about 2 m.m. across, was found on sectioning the ovary.

The right ovary was much larger, due to cysts. Two of the larger cysts contained six or seven cc of a bloody fluid. This ovary contained a large number of smaller cysts or follicles and the walls of all but a few appeared shiny, as if the granulosa was gone. Two corpora lutea were present, of an orange color, and 10 m.m. each in diameter.

Vestibule: Lymphatics were very small; one retention cyst. The bulb markedly congested.

Vagina: Yellowish cast throughout; contained considerable mucus which was adhesive and gummy; wall thick, folded, some areas congested, some others yellowish and an occasional petechia. Canals of Gartner very prominent and could be traced almost to cervix.

Cervix: Long, hard, overhanging folds project into vagina and these are markedly congested. Cervix covered by a clear, more cohesive mucus than the vagina. Four folds in the cervix.

Uterus: Contained a gummy, mucus-like material on its interior. It was markedly abnormal, very much like Ex. 17, except more vascular. Blood-vessels were very prominent and cotyledons were a whitish gray.

Uterine tubes: Slightly enlarged; low-grade peritonitis over them, with slight adhesions; a little secretion in tubes.

Left adrenal: Medulla greyish instead of a yellow.

Right adrenal: Same as left, maybe slightly worse.

Hypophysis: Dirty-gray color, rather thick dorso-ventrally. A small gelatinous area.

(Histology of above will be published later).

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DISCUSSION

DR. J. N. FROST: In connection with these ductless glands and internal secretions, there is no question but that there is considerable work to be done. Personally, we have not used the extracts made from the ovary, but I have used, to a considerable extent, extracts from the pituitary gland and from the adrenal. In those cases where, upon rectal examination, you are unable to find any inflammation of the cervix, any inflammation of the uterus or tubes, we do get results from the use of 2 cc of pituitary extract and 0.5 cc of adrenalin.

For instance, you take a cow that has been on butter-fat test, perhaps for a considerable length of time. She is kept in very good condition, and very often in those animals we find the uterus and ovaries are not functioning normally. You make an examination of the genital organs, and the principal thing you find is lack of tone; the uterus will seem flabby; perhaps it extends a little further forward into the abdominal cavity than it should; it does not lie back in the pelvis as it should; the ovaries often are not ovulating. In those cases, we do get results by putting those animals on the pituitary and adrenalin injections. It seems to stimulate the whole genital tract. We get a better tone, and in a short time get the ovaries beginning to ovulate and the animals come along and breed. We use that very frequently in those cows where there is nothing seriously wrong with the genital tract except a lack of tone and a need of stimulation.

Personally, I believe a good deal of this stimulation produced by these extracts can be produced simply by massage. Where you can massage the ovaries and uterus carefully, you get a good deal the same stimulation, and I have found that where you can do that, you get much the same results. Of course, that means that you must have a case where you can see it frequently, so you can massage the ovaries and the uterus, and in that way get stimulation, and I have found that we got much the same results in those cases as you do by the injection of these different agents.

Then, take a young heifer: Dr. Murphey mentions one case in particular that was not breeding, but coming in heat, and apparently with normal genital organs. I have found that by using pituitary extract and adrenalin on those, that very often we got good results. Then, in those heifers which have a tendency to take more the appearance of a steer, they begin to get fat, do not look like a dairy animal, look more like a beef animal, perhaps reach two or three years of age without breeding—I have found very often we can change the character of that animal by using the pituitary extract with the thyroid extract. It has a tendency to do away with that fat condition. It seems to stimulate them more to the dairy type of animal. They lose that appearance of the beef animal and, in some cases, it seems to work very well.

QUESTION: How many doses do you give?

DR. FROST: We repeat it until the uterus gets back to a normal tone and until the ovaries begin to function normally.

QUESTION: What doses?

DR. FROST: Two to two and one-half cc. Give that about twice a week.

QUESTION: Is that for the case of the heifer that takes on more of a beef appearance?

DR. FROST: Yes. Give it about twice a week and continue it until examination shows that that animal is getting back to normal condition. For instance, I have a cow under treatment now. She is a Guernsey, has been on test, making something over 800 pounds two years ago. I started in about three months ago treating that cow. She has not bred. I treated her several times. On first examination, all I could find was that the cervix was normal, the uterus elongated, but not inflamed, lacking in tone, soft and flabby; the

ovaries were not functioning; she was not coming in heat. We started treating that cow simply by massage of the uterus. I had the attending veterinarian massage that cow once a week, and put her on pituitary with adrenalin twice a week, and I examined her about a month ago—that was after she had been under treatment about six weeks—there had been a little slip-up in the treatment, because the herdsman had broken his leg and the treatment was not continued as carefully as we would have liked to have it—and even under the unfavorable conditions and difficulties that cow was improving rapidly. Her uterus had become practically normal, the ovaries were not functioning normally, but had showed one heat period, showed that she was coming. I do not think there is any question but that that cow is going to come along and make a good breeder, in spite of the fact that she has not bred up to the present time. There is nothing functionally wrong with that animal. She simply needs a little stimulation.

DR. J. N. SHAW: Have you met with the condition of heifers where you do not find any relaxation of the uterus, lack of tone, or whatever you wish to call it, apparently everything is normal, and still they fail to conceive? In my locality, I find men finding it necessary to keep fifty per cent of the heifers they are raising to take the place of the cows that they have to turn off. Upon examination of these heifers, you find them apparently normal. They are coming in heat regularly, but they will not conceive, and I wonder if you have met with that condition, and have tried the pituitary extract on those cases.

DR. FROST: Yes, I have. We have a good deal of trouble with heifers not breeding. There is one suggestion I want to make, though, that you be very careful in the examination of the cervix of those heifers. We find a great many of those heifers with a mild inflammation of the cervix, and simply by using a very hot douche, a good many will clear up. If there is nothing wrong there, I admit a good many times this mild inflammation of the cervix is pretty difficult to detect; in a good many of those heifers, you can not get into the vagina; the vulva is so small that you can not get in there, and the only way to make the examination is by feeling through the rectum. When you are examining through the rectum, as you draw your hand back over it, very often you will find a little thickening, as a washer over a bolt, and if you find that, there is an indication that there is inflammation in that cervix, and in these heifers a good many times that is the only way you can detect it. If we do not find it, we put those heifers on adrenalin and pituitary extract. We get good results.

QUESTION: Without massage?

DR. FROST: We always massage the uterus and ovaries anyway.

QUESTION: How can you say you are getting results from the adrenalin and pituitary extracts, rather than the massage?

DR. FROST: You can not differentiate if you do both, but the idea is this: a good many times you massage without the other, and you do not get results. You use the extract, and you get results.

QUESTION: To what would you attribute inflammation of the cervix in a virgin heifer?

DR. FROST: It is difficult to tell; sometimes it is simply an infected bull. For instance, this last month I had a herd of cows with which the man was having rather hard luck. He had nine heifers that were all infected. All they had was a little inflammation of the cervix. We examined the bull and found that was where the trouble was. The inflammation was coming from the infection of the bull. That is one thing I would be careful about. When you have an infected bull, it will show up more quickly in heifers than in old cows.

QUESTION: In inflammation of the cervix, is there any purulent discharge?

DR. FROST: Not necessarily. You may have a mild inflammation. You would not notice any discharge. There may be a little purulent discharge on the vulva; not often. Very often, you will have a mild cervicitis which will interfere with conception, and with which you will not be able to detect a discharge.

QUESTION: If it should be of infectious origin, why should the hot water douche clear it up?

DR. FROST: When I said hot water, I meant hot water with some antiseptic or salt solution in it. I believe, however, that in a good many cases, hot water would clear it up. It is the flushing effect as much as anything.

DR. SHAW: Do you not believe it is the hyperemia that is produced from the heat that clears up this infection of the genital tract, and a good thing to use would be lysol or some other antiseptic solution?

DR. FROST: I certainly do. That is why I said, "Use it hot."

DR. A. F. HANNA: I would like to ask Dr. Frost, or any of the other members present, if they do not consider in this question of sterile heifers or heifers that are failing to conceive—I sometimes do not like to call them sterile, although they have failed to conceive—what their relation is to the method in which that stuff is raised and the breeding. We have in the section of the country that I come from, a great activity in calf-club work. We have comparatively few pure-bred men. The few pure-bred men that we have, try to be unusually good to their heifer calves. The kids naturally are good to them. The biggest portion of the heifers that we have, that have failed to conceive, are in this class. You take the ordinary run of dairy stuff that is put out in the little pen. They come along with a can of skim milk and dump it into them. They fight with the rest and get out and run around, and as a pure-bred man looks at it, are only about half-raised. It is the heifers that have been babied along and fed heavily with which we have the most trouble.

Have any of you had that experience, and what is your idea of the relation? Have you noticed that?

DR. FROST: There is that tendency, of course, I think, with a heifer. Take a calf of that kind. The kids think lots of it and take the best care of it. Usually, if anything, it is over-fat. Quite often it is not turned out to rustle with the rest of the calves, and does not have the life that the rest of the calves have. A good many times it does not get the exercise which tends to a good healthy animal, and I think those things do have some bearing; there is no question about it. There is another thing you brought up, and that is this: A scrub animal does have, many times, better resistance than your more finely bred animals, that have been babied and carried along.

DR. H. W. BROWN: In that connection, I think that I have had some experience along that line, and I know that, not only in that trouble, but in any other disease, you have a lack of development of the genital organs where you have a lack of exercise in the growing period. I know we have had the same trouble in prolapse of the vagina in beef animals, over at the College, where they were raised without any exercise and kept over-fat all the time. I think there was lack of development and strength of the tissues, and in this case, the lack of development of the genital organs would have the same bearing.

DR. ALFRED HENDRIKSEN: I have found, in our State, there are several young animals, and for that matter, cows, too, which upon examination show all the sexual organs to be all right except for the infection, vaginitis. I have in the last two years, treated about 3000 cases, where 75 per cent of those cases have been nothing but that. We have treated this vaginitis, and we got results in 90 per cent, that is, the first time, and came in heat afterwards. I think this should be looked into. We find if very common in heifers.

CHAIRMAN STEEL: What is your line of treatment?

DR. HENDRIKSEN: In a heifer where the vagina is small, I use the speculum, and when I find that condition, I leave an irrigating fluid with the men. Any of the iodin solutions will be suitable for the treatment. I generally treat them this way: Start the fifth day after the animal has been in heat, give one injection every other day for six times. That leaves five or six days clear before the animal comes in heat again, and the doses are generally about a tablespoonful to two-thirds pint of water. That has given us results in most cases—about 90 per cent.

CHAIRMAN STEEL: I would like to report at this time a little experience I have been having along this line. In treating beef cattle entirely, I find that most of these animals come in heat regularly, but simply will not con-

ceive. The method I have been following I have never heard reported, but I have been using it, I think, with very good success. That is a 50 per cent Lugol's solution. Upon examination through the rectum, I find the organs practically normal, and on introducing the cathether into the uterus, I find very little or no discharge. I find examination of the os shows nothing, but if anything, a very mild catarrh. Some cases have a history of retained placenta. The way I have been handling these cases has been to examine through the rectum and massage the uterus and ovaries; express the corpus luteum if there is one. I find that in beef cattle, I can not work through the vagina very well. I wash them out first with a dilute soda solution and then sterile water; I use it mildly warm. Following that, I put in about eight ounces of 50 per cent Lugol's solution, using four ounces of the solution and four ounces of sterile water. (Pour that over your hand, and it will stain it dark brown.) Then I leave that in, and as I draw the catheter out through the cervix, I let some of that run through the cervix. In beef cattle, when we can not draw the cervix back, we can not put a pledget of cotton under the os and keep from irritating the vagina. However, the cow quits straining, from irritation of the vagina, in a few hours.

It may be that just the massage and the handling of the ovaries has brought some of the results, but I treat these cases only once. I go out and treat them when they are in heat. Most of them that I have treated have conceived after one treatment. I have treated a few of them twice, although the treatment should not be repeated often.

Now, in investigating this work, the only research work that has been done along this line, to my knowledge, has been done by Dr. Hallman. He took eleven cows and injected them with fifty per cent Lugol's solution, and some with straight Lugol's solution, and then killed the animals. Then he examined the effects of the iodin on the uterine mucosa. He found that the epithelium was completely destroyed by the iodin, but epithelization started again from the ducts of the glands as early as seventy-eight hours, and within a period of two weeks, epithelization and repair to the uterus were complete. He suggested that it might be dangerous to give this treatment to animals when they were in heat, due to the congestion, and there was some evidence of hemorrhage in the uterine muscularis.

However, I found that it is very hard to get the catheter into some of these animals, and I have gone back again to treating them during the heat period. To date, I have had no fatalities in doing this work. You would think that the irritation would be very severe, but I have treated some animals worth as high as $2000, and in fact, the only animals I do get to treat in the beef type are the very best ones.

With regard to the condition of the animals, there is one cow I treated last summer that was very, very fat. I expected to find some of this fat necrosis, but did not find it. The organs were practically normal, as far as I could tell. I gave her the one treatment. She conceived the next heat period, although I generally advise the owner to let them go one heat period to make sure the uterus is cleaned up. She conceived and had a heifer calf.

Now, that may be luck, but I had to resort to a radical treatment because the beef-breeders will not allow the running-up of a bill over a long period in treating beef cattle, for they can market them for slaughter at good prices.

QUESTION: Is that for vaginitis?

CHAIRMAN STEEL: I could not tell. I think the condition is a mild infection. Except possibly for this ring in the cervix, I could not find anything particularly the matter with them at all. There was no discharge; the ovaries were normal; came in heat regularly; the oestrual cycle was there, and I resorted to this treatment to take the place of what physicians used to resort to in the human—curettage. They scraped the uterine mucosa. It was a bloody operation. I understand now these men are using iodin entirely. They are treating the uterine mucosa with iodin instead of doing that.

QUESTION: I would like to ask Dr. Frost if he meets the condition where the uterus in the virgin heifer is greatly disturbed with puerpural material, in one that has never been bred, and to what he would attribute that condition.

DR. FROST: Sometimes we get heifers that have never been bred, with the uterus and the vagina distended, simply because the hymen has not been ruptured, and you have the uterine discharges held there, because they can not get out. We get that occasionally. It is simply a question of breaking down the hymen and allowing those discharges to escape. Of course, if it is simply confined to the uterus and not the vagina, that would mean that you had some stoppage of the cervical opening.

DR. WM. C. NYE: I was assisting Dr. Kingman at one time, and after we had broken the hymen and drained it, we could not introduce the smallest catheter into the cervix.

DR. FROST: That is often true. You have trouble getting the catheter through the cervix. Very often you have to use the dilator before you can get the catheter into the cervix anyway. That is when the cow is not in heat. When the cow is in heat, the cervix naturally dilates.

DR. NYE: Each one examined was extremely vicious. Was that merely a coincidence?

DR. FROST: There is a possibility that the retention of the fluid in the uterus, the distention of the uterus, might have an effect on the animals, causing them to be vicious. The same thing is true in bulls with a serious infection. Very often, it will cause them to be vicious.

QUESTION: Is it an easy matter to pass the catheter in virgin heifers?

DR. FROST: No, it is not an easy matter. The cervix will be closed, so you have to have a pretty small catheter, and very often it is pretty difficult to get in them.

DR. SHAW: Would you not have to cause dilation of the cervix by manipulation, in cases of that kind? You would be more apt to produce a disturbance there that would last more than a few hours. It is pretty hard to keep from introducing bacterial life in the manipulation; at least, that has been my experience. I have always been rather afraid to carry out those manipulations. I have confined my efforts to massage.

DR. FROST: I think that is true to a certain extent. We are not doing nearly so much washing of the uterus, but more massage. We are getting away from that old idea of washing the uterus. There is this thing in passing the catheter through the cow—before you do that, you should swab the cervix with Lugol's before attempting to put the catheter through.

WISCONSIN VETERINARIANS PLAN IMPORTANT MEETING

Wisconsin veterinarians will have an opportunity to attend both the fourth annual short course offered by the University of Wisconsin and the eleventh annual meeting of the Wisconsin Veterinary Medical Association, at Madison, January 26-29, 1926.

According to Dr. F. B. Hadley, "the program is replete with topics of the greatest scientific and practical interest to practitioners of veterinary medicine. Men of nation-wide reputation have been secured to lead the discussions, hold the demonstrations, and conduct the clinics, so the success of the meeting is assured."

Members of the University faculty will assist the prominent veterinarians from without and within the State, in putting on the well-balanced program that is offered. Arrangements have been made for an instructive clinic, featuring both large and small animals. A number of new surgical procedures will be demonstrated.

PRACTICAL RESULTS OF ATTEMPTS TO CONTROL ABORTION DISEASE*

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The history and the bibliography of abortion disease have been published so often that we feel it is unnecessary to repeat these here. We have used freely the facts which have been established by other students of this problem.

This report is a resume of results obtained in a herd in which three different methods of control and eradication have been tried. The method of management of this herd is such that cows are calving during every month in the year. During the years 1913 and 1914, there were no abortions in this herd. Three of four pregnant females, introduced in 1915, terminated their pregnancies by aborting.

The first experiment began at this time. This consisted in an attempt to control the disease by following the usual recommendations concerning isolation and vaginal douching of aborting females, disposal of aborted fetuses and their membranes, and disinfection of quarters. The herd sires were used on all females, regardless of abortions, but in no instance was a cow or heifer with a noticeable abnormality of the genital organs mated. Calves from both positive and negative dams were fed the mixed skim milk from the entire herd. Occasional laboratory tests of this milk revealed the presence of *B. abortus* (Bang). This plan was followed for five years, during which time the percentage of abortions gradually increased. Table I is a record of this herd during the last two of these five years.

In December, 1920, the second experiment began. This consisted in placing the negative animals in a wing of the barn that is fairly well separated from the portion in which the reactors were kept. This wing was disinfected, and every animal had its feet, legs, and tail washed in an antiseptic solution before this change was made. Fairly successful attempts were made to prevent any direct contact between reacting and negative animals. The negative animals were not allowed access to any pens, corrals, or pastures that were being used by the reactors. The brooms, implements, etc., used to clean the wing in which the

*Presented at the sixty-second annual meeting of the American Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

TABLE I—*Results of first experiment*

YEAR	COWS	REACTORS		NEGATIVES		ABORTIONS		NORMAL CALVES		CHANGE — TO +	SOLD AS STERILE		AV. MILK PRODUCTION		DIFFERENCE
		No.	%	No.	%	No.	%	No.	%		REACTORS	NEGATIVES	REACTORS	NEGATIVES	
1919	54	41	75.9	13	24.1	14	25.45	41	74.54	8	2	0	4,964.53	6,693.21	1,728.68
1920	52	36	69.2	16	30.7	12	25.53	35	74.47	8	4	0	4,506.36	5,704.42	1,198.06

TABLE II—*Results of second experiment*

YEAR	COWS	REACTORS		NEGATIVES		ABORTIONS		NORMAL CALVES		CHANGE — TO +	SOLD AS STERILE		AV. MILK PRODUCTION		DIFFERENCE
		No.	%	No.	%	No.	%	No.	%		REACTORS	NEGATIVES	REACTORS	NEGATIVES	
1921	64	40	62.50	24	37.50	12	21.42	44	78.57	9	2	0	5,616.70	7,976.70	2,360.00
1922	79	48	60.75	31	39.25	10	16.66	50	83.33	3	5	0	4,710.22	8,542.00	3,831.78

negative cows were kept, were not taken out of that wing. The same milking machine was used on the two groups, but the negative animals were milked first each time. The machine was dissembled, cleaned, and sterilized with live steam after each milking. The attendants caring for the negative group cleaned and groomed in only that wing, but they helped with the milking of both groups. Agglutinations were made monthly, and all new reactors were immediately removed from the negative group. In this experiment, the calves were handled as outlined in the previous experiment. This plan was followed for two years, during which time the percentage of abortions did not decrease materially. Table II is a record of this herd during these two years.

In September, 1922, the third experiment began. This consisted in handling the herd according to the system which we had previously recommended for the control and eradication of abortion. We removed all the reacting females to premises approximately one mile from the original barn, prevented any subsequent contact between positive and negative animals, prevented the use of contaminated pens, corrals, and pasture by the abortion-free group, and had separate caretakers handle the two groups.

The use of the same herd sires continued, but separate breeding pens were maintained so that no negative animals came in contact with the ground used by the reacting cattle.

Calves born in the infected barn were usually left with their dams for about three days. They were then transferred to an isolation pen in the original barn. Those which gave negative agglutinations were removed after a month or six weeks, while positive reactors were kept in this pen until the test became negative. In no case was this longer than three months. At the time of removal from the isolation pen, each calf had its feet, legs, and tail washed in an antiseptic solution. Following this, it was placed in the regular calf pen with the offspring of the abortion-free group. This pen was in the main barn and immediately adjacent to box-stalls for lactating cows. All calves in this pen were fed skim milk. During a part of this time, the skim milk was obtained from a small creamery. It was not feasible to make the agglutination test on all animals supplying this milk.

The results of two years of handling the herd according to this system are given in table III. It is interesting to note that

when the two groups were separated, the economic losses in the infected group were so apparent that the owners disposed of the entire reacting group at the end of two years. Table IV gives the data on this reacting group.

TABLE III—*Results of third experiment. Cows left after separation was made.*

YEAR	COWS	ABORTIONS		NORMAL CALVES		CHANGE — TO +	SOLD AS STERILE	AV. MILK PRODUCTION
		No.	%	No.	%			
1923	33	0	0.0	32	100.00	3	0	7,343.43
1924	46	1	2.17	45	97.82	7	1	6,290.79

TABLE IV—*Data on reacting group left after separation was made.*

YEAR	COWS	ABORTIONS		NORMAL CALVES		SOLD AS STERILE	AV. MILK PRODUCTION
		No.	%	No.	%		
1923	26	5	21.73	18	78.26	3	4,543.91
1924	24	5	26.31	14	73.67	2	3,261.70

SUMMARY

1. We were not able to control abortion disease through temporary isolation of aborting cows, destruction of aborted fetuses and their membranes, and disinfection of stalls in which abortions occurred.

2. We did not control this disease through separating the reacting animals from the negative animals, but keeping them in the same barn.

3. The adoption of a method similar to the Bang system in tuberculosis control has given results satisfactory to the owner as well as to the veterinarians.

4. The yearly average milk production per cow in the infected group was 35 per cent less than in the abortion-free group.

DISCUSSION

DR. PETER MACINTOSH: Was there any follow-up work in connection with postmortems?

DR. MILLER: There were postmortems on some of them. We checked the postmortems in every case where we possibly could do so.

DR. MACINTOSH: Did you arrive at any conclusion from those tests?

DR. MILLER: On some of them we did; on some we did not. As I remember it, most of the trouble was due to ovarian disturbance. I do not have the figures here, however, but I think most of them were ovarian disturbances. Regarding the cow in table III that was not a reactor, I was doubtful as to

the cause. She stood around in the barn for about a year, with the tail raised and the ligaments relaxed, and when we held an autopsy, we found nothing but the two ovaries degenerated and adhesions around them and cysts all the way through.

DR. J. W. KALKUS: Bearing on this same line of work, it might be interesting to report some work of a similar nature we have been doing in Washington in the past two years; especially in one herd, at the Western Washington Experiment Station, where we have had direct supervision of the herd and where we have had much better success, apparently, as far as practical control is concerned, based upon the tests, than the results shown here by Dr. Simms and Dr. Miller.

In that herd, two years ago, we had a little over fifty per cent reactors to the agglutination test. We separated our herd into two groups, depending upon the reaction—the reactors in one, and the negative animals in another—and kept them separate, while the cows are at liberty in the pasture or during the winter time in open sheds. They, however, have been milked in the same barn. They have had the same attendants and, during these two years, there has not been a single additional reactor develop in that herd.

We have added to the herd seventeen heifers, calves from the cows in the herd which we raised in a separate pasture from weaning time until they were of breeding age, although they were fed prior to that time on abortion-infected herd milk. Many of these seventeen heifers have calved the second time, and none of them has become a reactor and none of them has aborted. These are exceptional results, we think, and vary considerably from the results shown here. We have used the same sires, but we have kept the cows isolated during the freshening period and, in case of retained placenta or other uterine troubles, until all discharge has ceased. We have not had any additional reactors develop, nor have we had any cows that originally reacted become subsequently negative.

I attribute the success of that demonstration largely to the fact that the cows are brought to the barn for the purpose of milking only; they are not fed there. There is a concrete floor in the milking barn, and that is scrubbed and hosed once a day. Neither is there any hay kept in that milking barn, so there is not much chance of infection being carried on the hay or on the attendants' shoes or clothes to the negative cows. We have continued that for two years, and have been very successful in the control of abortion.

We have tried the same manner of handling cows in privately owned herds on ordinary dairy farms, but we have not had the same success. We have had reactors result in herds of that kind. In these herds, however, the cows are fed hay in the milking barn, and in many instances the hay is usually in the alley-way, so there is the opportunity to carry the infection on the hay, and the cows may possibly get the infection in that way.

DR. W. B. COON: I would like to ask Dr. Kalkus if he can state the number of abortions he gets from the reactors?

DR. KALKUS: I could not state definitely. I have not tabulated the results, as yet, but the majority of the reacting cows in that herd were either past aborters or have aborted since. There are a few cows in the herd that have never aborted, although they have continued to be reactors throughout the entire two years and were, no doubt, prior to that time, but most of the cows have aborted once or twice, either before or since the test was made.

DR. E. A. CAHILL: I am just wondering, in view of the reports and the statistics given here, whether your condition on the Pacific Coast is different from that east of the Rockies. The agglutination test is unreliable as an individual index to the situation, and we have gotten pretty well away from the idea of using that test, except as a herd index. I am frank to say I think a little too much of my reputation to send out reports from a laboratory to practitioners who are depending upon me, saying that a cow should be placed in table number 1, 2, 3, or 4. It does not always work out.

Everybody, no doubt, is familiar with the work done by Dr. Fitch and presented last year at Des Moines. Dr. Fitch sent samples of blood to twelve different laboratories. I know in at least one particular laboratory the tests were conducted just as conscientiously and thoroughly as it was possible to

do it, and I know in the other laboratories the same thing applied, but the results did not agree at all. I can not quite reconcile that with the very favorable results shown on this chart, and I raise the point, not to question anything here, but to see whether or not you men on the Pacific Coast have something we have not got back East.

DR. KALKUS: I did not mean to imply in my discussion that I depended absolutely on the test. In fact, I believe I have some experimental results now that show why a practitioner who does not pay any attention to the agglutination test, and does not depend upon it at all, has been having very good success in his control of the trouble. This has been due to the fact that the majority of cows are dangerous spreaders only during the time and some time after they abort.

You will find, in literature sent out, that the statement is very commonly made that a cow reacting to the agglutination test is just as great a source of danger when she carries a full-time calf as she is when she aborts. I have had occasion to check up on that particular phase of the problem, and I find that the reacting cow that discharges abortion germs when she calves at full time is the exception rather than the rule. I am not able to find very many specific cases where *B. abortus* has been demonstrated in the discharges from reacting cows when they carried full-time calves.

I have, in some twenty-five cases, made bacteriological examinations of the uterine discharges of reacting cows which had previously aborted and from which at that time *B. abortus* was isolated, and we have been unable to find the organism in those same cows when they subsequently calved, notwithstanding the fact they were reactors at the time and had infection in the udder.

I find, in checking over the recent experiments at the California Station, that in some of their animals which were inoculated with pure cultures, some of them aborted and some of them did not. I find in checking over the results, that in a majority of the instances, or in every instance, if I remember correctly now, the cows that were infected and that aborted showed the presence of *B. abortus* in the uterine discharges, but those that carried full-time calves did not. So I concede, from a practical viewpoint, if the practitioner depends upon the aborting cow as the greatest source of danger and isolates that cow, he will make just as good headway in controlling the trouble as a person who depends upon the agglutination reaction as his guide. I think that is the thing that gives rise to the differences of opinion of men in laboratory work and those in practice. I think that is one point that has been overlooked. The statement that is commonly made that a reacting cow, when she calves at full time, is just as dangerous as an aborter is, I believe, erroneous.

DR. MACINTOSH: In applying the agglutination test, do you find cows that do not react to the test but yet will abort?

DR. MILLER: I find very few such animals. I think occasionally there is one. We have a record of one cow on this list here, and we have found a few others. We have found one herd in Oregon in which there were several abortions and a negative reaction. However, the cow that aborts—and I am speaking of the Oregon cow; we have not tested others—and continues to give a negative test afterwards is a relatively rare animal. We find some, but we do not find epidemics or large percentages.

We have failed to find any herd in which there was a large percentage of abortions that did not show up on the agglutination test.

I might say, in discussing Dr. Kalkus' statement, that we have in some instances isolated the bacillus from the cows that carried the calves full time. We have not attempted to do it very often. I know our results have been opposite on at least one or two occasions.

DR. KALKUS: I have had one cow in about twenty-five, and the question there was whether or not that calf was a few days premature.

I might add that my results have been just a little bit different from those of Dr. Simms, regarding the aborting non-reactor, in this respect: In herds with recent infection, I found quite frequently cows that are non-reactors subsequently abort, and from which *B. abortus* can be isolated, and that

same cow will react within ten days or two weeks after that abortion. I also find occasionally a cow in a heavily infected herd that aborts that is not a reactor, and from which *B. abortus* can not be isolated.

DR. MILLER: We were not the first to have observed this. It is not an unusual thing to find a cow that is negative at the time that she aborts. We always advise that blood samples should not be collected the day that the cow aborts or for two or three days following. In herds where we are making regular tests and a cow is positive right along and then she switches to negative, we have been able to tell the herd manager to separate that cow—she is going to abort—and she does abort very frequently. A cow will come positive again in five or seven or ten days following the act of abortion. That is one thing that has given the agglutination test a bad reputation. The cow aborts, and the practitioner collects the blood the same day, and that is where the trouble comes in.

DR. H. A. TRIPPEER: How were these additional animals handled relative to the bull?

DR. MILLER: All the way through, bulls were used on both the positive and negative animals. Even when that herd was separated into groups 3 and 4, we used the same bull, but in no instance did we use a common breeding-ground. They were bred on opposite sides. There was no contact with soil that was possibly contaminated, but the same herd sires were used right straight through.

MINNESOTA PRESENTS INTERESTING PROGRAM

The twenty-ninth annual meeting of the Minnesota State Veterinary Medical Association will be held in Minneapolis, at the Radisson Hotel, January 14-15, 1926. A number of very interesting papers and discussions will be presented at that time. "The Use of Calf Scours Serum in Treating Cases of Mastitis" will be presented by Dr. A. C. Spannaus, of Waconia; "Practical Experiences in Fox Farming and Handling Diseases of Foxes," by Dr. Carl Hanson, of Faribault; "Factors Affecting the Practice of Veterinary Medicine," by Dr. G. Van Duzee, of Lamberton; "Small Animal Practice," by Dr. A. A. Feist, of St. Paul; "Milk Control Work in Rochester," by Dr. D. C. Lochead, Health Officer of Rochester.

Dr. J. W. Kummer, of Hastings; Dr. W. L. Boyd, of St. Paul; and Dr. C. F. Schlotthauer, of the Mayo Foundation, at Rochester, will present a discussion of problems in connection with dystokia, sterility, and parturient paresis in cattle. Dr. H. C. H. Kernkamp, of St. Paul, will speak on "Poultry Diseases." Dr. H. A. Greaves, of Glenwood; Dr. D. L. Halver, of Shakopee; and Dr. C. E. Cotton, of St. Paul, will have papers on "Testing Cattle for Tuberculosis," "Tuberculosis Control Work," and other animal diseases. Dr. John W. Adams, president of the American Veterinary Medical Association, will speak on "Professional Charges and Field Surgery." Dr. C. A. Nelson, of Brainerd, will present a paper on "Trifoliosis," and Dr. C. H. Wetter, of Princeton, one on "Bracken Poisoning."

A NOTE ON EXAMINING BULLS FOR GENITAL SOUNDNESS

(And Preparing Semen Smears for Examination)

By W. W. WILLIAMS, *Springfield, Mass.*
and A. SAVAGE, *Winnipeg, Canada*

The value of healthy service bulls is gradually becoming better recognized, both among the profession and the laity. During the past few years various contributions have appeared in veterinary literature dealing with the genital pathology of these animals and its relation to that of cows as well as to the whole subject of reproduction. Despite this, however, it seems evident that the facts brought forth have not received the widespread clinical application which their importance merits.

This may be ascribed mainly to two causes: First, the general belief that "bovine infectious abortion" is, directly or otherwise, the only important cause of reproductive losses, and that, since this is almost solely an infection of the pregnant female, the bull may be safely excluded as a factor, Second, that regrettably many veterinarians are unfamiliar with the physiology and pathology of the male genitalia. But, at this point we venture to predict that, in the not very distant future, enlightened cattle breeders will make the competent veterinary examination of their bulls as much a matter of routine as the tuberculin test, perhaps more so.

There are three ways in which a bull's fitness for service may be ascertained:

(1) by his record as a breeder,

(2) by a thorough clinical examination and

(3) by a microscopic study of his semen.

Each of these has a part in leading to a definite conclusion and each primarily concerns a different individual, though the practitioner must interpret them all to the owner.

Thus, the owner is chiefly concerned with the breeding history. If this is consistently good, the matter ends there. If bad, it is the first to arouse suspicion. But, except in comparatively few instances, our experience has taught that actual records of mating are so incomplete that they break down under critical examination and are, therefore, unreliable other than in a general way.

FORM USED IN RECORDING EXAMINATION OF BULLS FOR REPRODUCTIVE FITNESS

CASE HISTORY FORM

Date.....Case No.....

Name of Owner
Address
Name of Bull Born.....
General Condition How exercised and amount
Diet
Kind of roughage Amt. per day.....
Kind of grain mixture Amt. per day.....
.....
.....
.....
.....
Succulent foods.....Amt. per day.....
Date entering herd.....Bought from.....
Any history of sickness.....
Age first used for service.....
Date of first indication of breeding trouble, if any.....
.....
Service rate—maximum per day.....per month.....
per week.....per year.....
Sexual desire.....Coitus.....
Record as breeding animal: Good.....Fair.....Poor.....

TOTAL	1ST YEAR	2ND YEAR	TOTAL
Cows served.....			
Times used.....			
Conceptions.....			
Abortions.....			

Group of females served—(heifers or cows)
Apparent health of females.....
Do cows discharge pus after service?.....
Remarks:.....
.....

OUTLINE OF CLINICAL EXAMINATION

Herd.....Case.....

Dates.....
Penis.....
R. Testis.....
L. Testis.....
R. Epididymis.....
L. Epididymis.....
Vas. deferens.....
Ampullae of Vas.....
R. Seminal Vesicle.....
L. Seminal Vesicle.....
Remarks:.....
.....
.....
Semen:

DATE	AMOUNT	COLOR	CONSISTENCY	COAG.	

MICROSCOPIC EXAMINATION

Case No.....

DATE	MOTILITY	ABUND.	MORPH.	REMARKS

DATE	TOTAL COUNTED	ABNORMAL HEADS PER M.	ABNORMAL BODIES PER M.	PER M.	PER M.	PER M.

Recommendations:.....

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To the clinician belongs the physical examination, and a little more. Not only must he inspect and palpate to the best of his ability but he should endeavor, by tactfully questioning the herdsman, to discover if there have been 'outside' services of which the owner is not aware. Clues of this sort are sometimes stumbled upon unexpectedly and should be followed. Finally, the examiner should obtain a proper sample of the animal's semen.

If he has the necessary facilities and a good microscope, the clinician can learn to complete the examination himself. Otherwise he is advised to send his slides to some laboratory where the necessary staining technic can be properly followed and a sound interpretation given of any unusual features that may be found. This is neither field work, nor, most emphatically, is it for the inexperienced. Yet, when well done, we believe, it constitutes the most important single criterion of a bull's sexual fitness and, therefore, cannot safely be omitted.

Frequently we have recevied improperly prepared smears. Usually they are too thick, the sperms being so clumped together that individual cells cannot be properly studied. On the contrary, at other times, there is so much vaginal mucus present that a sufficient number of sperms can scarcely be found. Occasionally the smear has been dried either too slowly or too quickly

(in an oven) and damaged in consequence. It seems, therefore, that satisfactory results cannot be expected unless a uniform method of preparation is adopted.

As an aid to those interested in this phase of genital disease control, we submit the following directions which have already proved useful in our work.

How to Prepare Semen Smears

(1) Having secured a healthy cow in estrum, wash the vulvar lips and adjacent regions with a mild disinfectant. Clean also the hands and arms. Enter the vagina manually (taking care not to cause bleeding), scoop out and discard as much mucus as can be obtained.

Note.—Healthy vaginal mucus is clear and colorless.

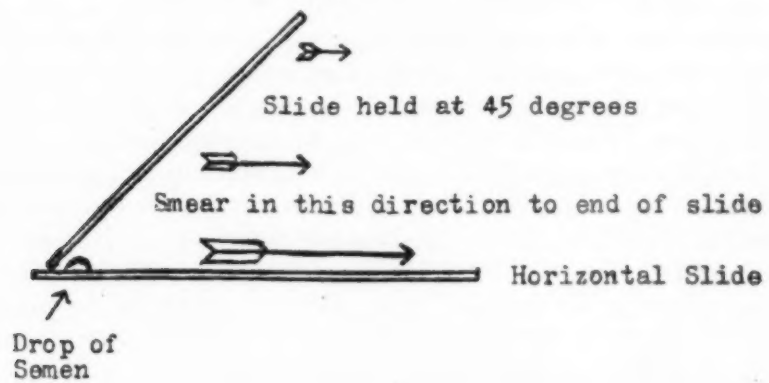
(2) Permit service.

(3) Scoop the semen, if any, out of the vagina by hand and place it in a small, wide-mouthed bottle. Dry the hands.

Note. Semen is usually whitish or pale yellow in color and opaque. There should be nearly ¼ ounce eliminated at a service. If none is obtained at the first service, try the bull once or twice more.

(4) If microscopic slides are not perfectly celan, wash them with hot water and soap, or with alcohol, and dry with a clean cloth.

(5) Place a slide flat on a table, and upon it, near one end, put a drop of semen. With a second slide, held against the first at an angle of 45,° pull the drop lengthwise on the horizontal slide with an even, single stroke, in one direction only, thus making a thin smear from one end of the slide to the other



(6) Dry the slide at once by waving it in the air. If the smear is uneven, wash it off and try again.

(7) Make at least four slides from each sample.

(8) Label and mark slides with clear identification numbers.

(9) Put the slides in a suitable box (there are many sizes made for the purpose), and place a little paper under the lid to prevent rattling. The box may then be wrapped in corrugated paper or cardboard and mailed.

We have, altogether, completely examined over 250 bulls, of which about one-third had poor breeding records. In searching for the causes of this low efficiency, clinical examination and the microscope played almost equal parts, jointly accounting for more than 95 per cent of the cases. There have been a few, however, that defied our best efforts at detection.

THIRD SHORT COURSE FOR MICHIGAN VETERINARIANS

Dean Giltner has prepared a very attractive program for the Michigan veterinarians who will go to East Lansing, the week of January 25, to attend the third annual post-graduate short course offered by the Michigan State College, in cooperation with the Detroit Department of Health, the State Bureau of Animal Industry and the U. S. Department of Agriculture. The program is well balanced and offers an opportunity for veterinarians to get the very latest information on timely topics from thoroughly reliable sources. The only expense outside of room and board while in East Lansing is a registration fee of one dollar. The course will start Monday morning, January 25, and continue until noon on Friday.

IOWA PLANS FOUR-DAY MEETING

The Iowa Veterinary Association will meet at Des Moines, February 2-3-4, and the annual Conference for Veterinarians will be held at Ames, February 5. A number of speakers from outside the State will contribute to the program, including Dr. John W. Adams, of the University of Pennsylvania and president of the A. V. M. A.; Dr. W. L. Williams, of Cornell University; Drs. L. Enos Day and E. M. Nighbert, of the U. S. Bureau of Animal Industry; Dr. R. C. Moore, of St. Joseph, Mo.; and Dr. J. C. Flynn, of Kansas City, Mo. Entertainment for the ladies will be provided this year, a new feature of the meeting. Secretary Steel says: "Ladies, bring your husbands."

A REPORT OF EXPERIMENTAL WORK ON THE BULL AS A FACTOR IN THE SPREAD OF INFECTIOUS ABORTION*

By R. E. LUBBEHUSEN *and* C. P. FITCH,

University Farm, St. Paul, Minn.

It is essential in considering the natural transmission of any infectious disease that we have an intimate knowledge not only of the channels through which the causative organism may be eliminated, but we must be ever on the alert to detect those factors which may aid in the spread of the disease, if we hope to meet with any success in control measures. Up to the present time much experimental effort has been directed toward the control of infectious abortion by the use of bacterins, vaccines, and a multitude of medicinal agents, with results that have not assisted in any marked degree toward solving the problem. Until such time as experimental work may establish a safe and efficient means for the control of this disease, our efforts must be based upon (a) the recognition of the infected animal, (b) proper quarantine as indicated by our present knowledge of the disease, and (c) a knowledge of the dissemination of the disease either by the active spreader or mechanical carrier.

The role of the bull in the dissemination of infectious abortion has long been a topic of much contention. Some investigators are of the opinion that the bull acts as one of the important factors in this regard, while others are of the belief that the bull acts merely as a passive carrier of the disease and is not actively concerned in its transmission. Hadley and Lothe,[1] after a rather extensive inquiry into the problem, summarized the results of their work by stating, in part: "Bulls with systemic infections were incapable of disseminating abortion disease to abortion-free heifers by cohabitation," and further, "Cows usually acquire abortion disease from other sources than the genitalia of bulls at the time of service." At about the same time (1916) Giltner and Hallman[2] made the following statement: "The bull may carry infection (abortion) from one animal to the other not by necessarily becoming affected with the disease, but through contamination of the penis and the sheath with the discharges of an In a later report (1921) Hallman[3] states: "Recent researches on

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affected cow he is able to convey the disease to other animals." abortion disease indicate that the bull is not as important a factor in transmitting abortion as was formerly believed."

On the other hand Rettger and White,[4] in discussing specific measures of control state, "Transmission by the male is by far the most important means of spreading the disease." Seddon[5] was able to produce infection of the testicle of one bull by intravenous injection of *Bacterium abortus* Bang, but presents no data on the elimination of the organism in the semen. He makes the general statement that "bulls may act as mechanical carriers of infection or may become infected in the testes or epididymis and eliminate organisms along with the seminal fluid." W. L. Williams,[6] in discussing the male as a spreader of genital infections, states, "All genital infections producing definitely recognizable specific lesions are freely interchangeable between the two sexes in coitus." This general statement must include definite data on the transmission of *Bacterium abortus* Bang, by this means.

Again, we have the much-quoted work of Schroeder and Cotton,[7] in which two bulls, giving agglutination reactions of 1-200 and 1-100 respectively, were examined. *Bacterium abortus* Bang was found in the epididymis of the bull giving a reaction of 1-200, while the organism was found in the semen of the remaining individual. These observations support the theory of the importance of the bull in the dissemination of the disease. Many clinical observations recorded would tend to prove that the bull is much concerned in the introduction of abortion infection into clean herds, while there is much data to show that abortion-free females have been bred with impunity to infected bulls, infection in all instances being based upon the interpretation of the serologic reactions of such individuals.

A summation of the results of experimental work thus far leaves one somewhat in doubt on several points. While it is generally agreed that the bull may act as a passive carrier of abortion infection, much difference of opinion exists as to whether or not the infected bull acts as a spreader. In the solution of this problem several questions present themselves: (1) What percentage of bulls, giving a positive serologic reaction, actually harbor *Bacterium abortus* Bang? (2) How many of those individuals, actually infected with *Bacterium abortus*, harbor the organism in the genital organs? (3) Assuming that certain genital organs are infected, does it necessarily follow that *Bac-*

terium abortus Bang will be found in the semen? In order to complete the chain of circumstances which must be fulfilled for actual infection to take place at the time of service, we must add: (4) How susceptible is the female to abortion infection by way of the vagina?

It was in an effort to contribute some data which might contribute to the solution of the above questions that the work herein recorded was undertaken. Ever since the agglutination and complement-fixation tests have been applied for the detection of *Bacterium abortus* Bang antibodies, such agglutinins or complement-fixing bodies have been demonstrated in the blood of bulls. However, inasmuch as an animal which reacts positively cannot with certainty be said to be actively harboring *Bacterium abortus* Bang, such a reaction leaves much to be determined when we consider control measures unless all reactors are viewed as spreaders and handled accordingly. While in the light of our present knowledge such drastic measures seem justified, there is much data to show that reacting bulls seldom harbor the organism in the genital organs and become active spreaders of the infection. Perhaps the most extensive work relative to active infection in bulls was that of Buck, Creech and Ladson.[8] These men were able to obtain the serologic reactions on 325 mature bulls, slaughtered over an 18-months period. Of this nunber, 37 gave a positive reaction for *Bacterium abortus* Bang infection. The genital organs, consisting of the vesiculae seminales, vasa deferentia, tests and epididymides were cultured from each of the reacting individuals, with the result that four of the number were found to harbor the organism.

Our own observations were at first directed toward determining whether or not infected bulls, showing a high-titre reaction, harbored the organism in the genital organs, and if so by what channel had the infection gained entrance. In other words, does infection of the genitalia depend solely upon the urethra as the portal of entry? Nine bulls whose sera gave negative reactions for the presence of *Bacterium abortus* agglutinins were used in this part of the experiment. Artificial infection was attempted by one of a combination of three channels, namely per os, intravenous injection, or by way of the urethra. The material given as a drench consisted of either fetal-stomach contents known to contain *Bacterium abortus*, or a saline suspension of virulent organisms, while infection by way of the urethra was attempted by douching the sheath with varying quantities of *Bacterium*

TABLE I—*Data on four bulls injected with living cultures*

Bull	Age (months)	Agglutination test, March 20, 1920	Intravenous injection living cultures, *Bacterium Abortus* Bang, March 24, 1920	Agglutination test, April 6, 1920	Agglutination test, June 4, 1920	Intravenous injection living cultures *Bacterium Abortus* Bang, June 8, 1920	Agglutination test, June 17, 1920	Agglutination test, August 13, 1920	Intravenous injection living cultures *Bacterium Abortus* Bang, September 11, 1920	Agglutination test, September 24, 1920	Slaughtered	Remarks on cultural findings
293	6	+ — — — — —	10 cc	+ + + — — —	+ + + — — —	10 cc	+ + + + + —	+ — — — — —	10 cc	+ + + + + +	9–24–23	Testes-sterile. Seminal vesicles-sterile Prostate-sterile. Sheath-*Staph. albus, S. aureus, B. subtilis*
297	6	— — — — — —	10 cc	+ + + + + +	+ + + — — —	10 cc	+ + + + + —	+ + + + — —			9–14–23	Testes-sterile. Seminal vesicles-sterile. Prostate sterile. Sheath-*Staph. albus, S. aureus*
298	6	— — — — — —	10 cc	+ + + + + +	+ + + — — —	10 cc	+ + + + — —	+ + — — — —	10 cc	+ + + — — —	10–4–23	Testes-sterile. Seminal vesicles-sterile. Prostate-sterile. Sheath-*B. coli, Staph. albus*
303	6	— — — — — —	10 cc	+ + + + + +	+ + — — — —	10 cc	+ + + + + +	+ + + + + —			9–13–23	Testes-sterile. Seminal vesicles-sterile. Prostate-sterile. Sheath-*B. subtilis, Staph. albus*

Note.—The agglutination titres are as follows: 1-25, 1-50, 1-100, 1-200, 1-500, 1-1000.

abortus organisms. Except in one instance (bull 24), no effect was made to introduce the organism directly into the urethra, inasmuch as it was thought such a proceedure would not be comparable to natural infection from the female at service. After artificial infection had been established, as evidenced by strong agglutination reactions, the animals were slaughtered and the genitalia examined by direct culture and guinea pig inoculation for the presence of *Bacterium abortus* infection. During the year 1920, some preliminary work was undertaken to determine the involvement of the genitalia of bulls by artificial infection with *Bacterium abortus* Bang. Four bulls, ranging from five to six months of age, were used. Infection was attempted by means of the intravenous injection of *Bacterium abortus* Bang. Inasmuch as these four animals were run as a group with identical experimental procedure, the data including bacteriologic findings is presented in table I.

It will be observed that none of the four animals gave either gross or bacteriologic indications of *Bacterium abortus* infection of the genital organs. Examination of other organs was not included. These negative results may be criticized in that a close observation of the serologic reaction of these four animals shows the presence of agglutinins to be transient in character and consequently there is occasion to question that an actual focus of infection had been established. It is to be regretted that it became necessary to slaughter these animals before several successive strong agglutination reactions were obtained. Additional work on artificial infection by intravenous inoculation was performed on one bull in 1924 and is recorded in this group.

Bull 53.

Purchased, March 25, 1924.

Agglutination reaction, negative.

Given an intravenous injection of 20 cc of live abortion vaccine on June 23, 1924.

Animal was bled every 24 hours for a period of eight days following the intravenous injection, in order to determine how soon *Bacterium abortus* antibodies would appear in the blood and the period of time which would elapse before the animal would give a strong positive reaction.

	Agglutination						*C. F.				
Bled	25	50	100	200	500	1000					
June 24, 1924	—	—	—	—	—	—	—	—	—	—	—
June 25, 1924	—	—	—	—	—	—	i	—	—	—	—
June 26, 1924	+	i	—	—	—	—	+	—	—	—	—
June 27, 1924	+	+	i	i	—	—	+	—	+	—	—
June 28, 1924	+	+	+	i	i	—	+	—	+	—	+
June 29, 1924	+	+	+	+	+	—	+	—	+	—	+
June 30, 1924	+	+	+	+	+	i	+	—	+	—	+
July 1, 1924	+	+	+	+	+	+	+	—	+	—	+
July 14, 1924	+	+	+	+	+	+	+	—	+	—	+

*Column headings (reading from left to right):—0.1, control; 0.05, control: 0.025.

Semen was procured and diluted with approximately ten parts of saline solution. One cc of this material was injected into each of two guinea pigs on July 25, 1924. Autopsy and culture of the pigs on August 28 failed to show the presence of *Bacterium abortus* Bang infection. Bled on September 2, 1924. Agglutination: + + + + + +. C. F.: + — + — +. Semen injected into two guinea pigs on September 8, 1924, according to the method used above. Autopsy and culture of guinea pigs on October 15, 1924, failed to show the presence of *Bacterium abortus* Bang.

Bled	Agglutination						C. F.				
October 2, 1924	+	+	+	+	+	+	+	—	+	—	+
November 3, 1924	+	+	+	+	+	+					
December 8, 1924	+	+	+	+	+	+	+	—	+	—	+
January 7, 1925	+	+	+	+	—	—	+	—	+	—	+

Animal injected with 40 cc of *Bacterium abortus* Bang intravenously on January 17, 1925.

Animal slaughtered on January 22, 1925. Genital organs were obtained for culture and guinea pig inoculation. All organs were apparently normal. Cultures made from the seminal vesicles, epididymides, testicles and prepuce failed to show *Bacterium abortus* Bang. Guinea pigs were inoculated with material from the testicles and seminal vesicles, likewise with negative results.

GROUP II

Following the preliminaty data no further work was attempted until 1923, when the observations on channels of infection and involvement of the genital organs were continued. At this time our attention was directed toward infection by way of the alimentary tract and urethra. The following data represent our observations on four bulls raised to maturity in our experiment herd from dams which gave strong serologic indication of infection. These animals were and had been negative reactors, since birth, for the presence of abortion infection. A brief history of each individual follows:

Bull 23.

Born, May 29, 1922. Dam was a strong positive reactor.

Agglutination on November 6, 1922, and January 24, 1923. Negative.

Drenched on February 1, 1923, with stomach contents of aborted fetus showing presence of *Bacterium abortus* Bang on culture.

Drenched on February 6, 1923, with stomach contents of second aborted fetus, also showing *Bacterium abortus* Bang on culture.

Agglutination reaction negative on February 8 and 14, 1923.

Drenched on February 19, 1923, with 60 cc of saline suspension of living *Bacterium abortus* Bang organisms.

Agglutination reaction negative on February 26, 1923.

Drenched on March 3, 1923, with 90 cc of saline suspension of living *Bacterium abortus* Bang organisms.

Agglutination reaction strongly positive when bled on March 22, 1923. The reaction remained positive until August 22, 1923. Soon after the latter date this animal developed a large abscess in the region of the right hock which became progressively worse.

Although it was our desire that this animal be kept for service to study vaginal infection in abortion-free heifers, it was finally deemed advisable to slaughter the individual and try to determine the possible involvement of the genital organs by means of a bacteriologic study and guinea pig inoculation.

Animal was slaughtered on August 22, 1923.

Organ	Gross Examination	Culture	G. P. Inoculation
Seminal vesicles	Normal	Sterile	Negative
Urethra	Normal	A few streptococci	
Testicles	Normal	Sterile	Negative
Prepuce	Normal	Large bacterial flora No *Bacterium abortus* Bang	

Bull 27.

Born, October 10, 1922. Dam reacted positively for infectious abortion.

Agglutination reaction negative on November 6, 1922, and January 24, 1923.

Drenched with 300 cc of a saline suspension of living *Bacterium abortus* Bang organisms on March 28, 1923.

Drenched with 300 cc of a saline suspension of living *Bacterium abortus* Bang organisms on April 10, 1923.

Agglutination reaction, taken at weekly intervals, was negative until May 15, 1923, at which time a positive reaction was obtained at a 1-100 dilution. This reaction persisted until June 25, 1923, when it dropped to 1-50.

Drenched with 500 cc of a saline suspension of living *Bacterium abortus* Bang organisms on June 25, 1923.

Agglutination reaction on July 9, 1923, remained 1-50.

Drenched with 350 cc of a saline suspension of living *Bacterium abortus* Bang organisms on July 13, 1923.

Agglutination reaction on July 23, 1923, was 1-100 and remained so until October 18, 1923, at which time another drench of 300 cc of living *Bacterium abortus* Bang culture was given.

The agglutination reaction remained at 1-100 until November 22, 1923.

Slaughtered on November 22, 1923.

Results of bacteriological examination:

Organ	Gross Examination	Culture	G. P. Inoculation
Seminal vesicles	Normal	Sterile	Negative
Testicles	Normal	Sterile	Negative
Urethra	Normal	Profuse bacterial flora No *Bacterium abortus* Bang	
Prepuce	Normal	Profuse bacterial flora No *Bacterium abortus* Bang	

Bull 29.

Born, October 20, 1922. Dam was a positive reactor for infectious abortion.

Agglutination reaction negative on November 6, 1922, and up to and including March 26, 1923.

Drenched on March 31, 1923, with 500 cc of fetal-stomach contents, from which *Bacterium abortus* Bang was isolated.

Drenched on April 5, 1923, with 500 cc of fetal-stomach contents, from which *Bacterium abortus* Bang was also isolated.

Agglutination reaction was negative on April 10 and April 17, 1923. On April 24, 1923, a reaction of 1-100 was noted, but became negative on May 3, 1923, and remained so until July 23, 1923.

The agglutination reaction remained negative until August 14, 1923, when a titre of 1-200 was obtained. This titre rapidly diminished until September 13, 1923, when it became completely negative.

Drenched with 250 cc of a saline suspension of living *Bacterium abortus* Bang organisms.

The agglutination reaction on October 18, 1923, was partial at 1-100. This reaction remained until November 22, 1923.

Slaughtered on November 22, 1923.

Results of bacteriologic examination of genital organs:

Organ	Gross Examination	Culture	G. P. Inoculation
Testicles	Normal	Sterile	Negative
Seminal vesicles	Normal	Sterile	Negative
Semen	Normal (microscopic)	Sterile	Negative
Urethra	Normal	Negative for *Bacterium abortus* Bang	
Prepuce	Normal	Negative for *Bacterium abortus* Bang	

Bull 24.

Born, May 19, 1922. Dam was a strong positive reactor for infectious abortion.

Agglutination reaction negative on November 6, 1922, and January 24, 1923.

Prepuce douched with 12 cc of a heavy saline suspension of living *Bacterium abortus* Bang on February 2, 1923.

Agglutination reaction negative on February 14 and 16, 1923.

Prepuce douched with 300 cc of a heavy saline suspension of living *Bacterium abortus* Bang organisms on March 3, 1923.

Agglutination reaction negative on March 22, 1923.

Prepuce douched with 30 cc of a heavy saline suspension of *Bacterium abortus* Bang on March 28 and April 10, 1923, respectively.

Agglutination reaction remained negative until July 13, 1923.

On July 13, 1923, 5 cc of a turbid saline suspension of *Bacterium abortus* Bang was injected directly into the urethra by means of a human catheter. Some difficulty attended this operation and the catheter was introduced only about four inches.

The agglutination reaction remained negative at weekly intervals until August 25, 1923.

On August 25, 1923, 5 cc of a turbid saline suspension of living *Bacterium abortus* Bang organisms was injected directly into the urethra. This time the operation was attended with greater success and the catheter was introduced approximately twelve inches.

The agglutination reaction up to and including September 13, 1923, remained negative.

A drench consisting of 350 cc of a slaine suspension of *Bacterium abortus* Bang organisms was given on October 5, 1923. This method was used, due to the fact that the prepucial and urethral injection was abandoned as an unsuccessful means of producing infection. It was further desired to produce infection so that this animal could be used in serving previously non-infected females.

A second drench consisting of 400 cc of a saline suspension of *Bacterium abortus* Bang was given on October 18, 1923.

Agglutination reaction remained negative until November 8, 1923, when a titre of 1-50 was obtained.

On November 19, 1923, this animal was transferred to group III. Further data will be given on this animal in considering the latter group.

GROUP III

Group III consisted of four males, infected by means of the intratesticular injection of *Bacterium abortus* Bang. This method was used in order to establish active foci of infection in the genitalia, to determine to what extent animals so affected eliminate the organism in the semen. The technic of injection was the same for all individuals of the group and consisted of the injection of 0.2 to 0.5 cc of a heavy saline suspension of *Bacterium abortus* Bang deep into the testicular tissue, using a 25-gauge needle. Every possible precaution was taken to guard against sepsis and mechanical injury of the testicular tissue. No effort was made to inject the organism into the epididymides or seminal vesicles, for it was our desire to check possible involvement of these sites from the original focus in the testicle. After infection was established, as evidenced by the serologic tests, samples of semen were obtained at intervals and examined microscopically,

culturally, and by guinea pig inoculation for the presence of *Bacterium abortus* Bang. Protocols of the group follow:

Bull 24 (record continued from group II).

On November 19, 1923, this animal was given an intratesticular injection of 0.2 cc of a saline suspension of living *Bacterium abortus* Bang (isolated from the testicle of a bull).

On December 1, 1923, there was evidence of an orchitis involving the right testicle. The organ was somewhat enlarged and the animal evinced pain on pressure. The orchitis became progressively worse, with the result that the testicle was removed on December 11, 1923, in order to save the animal for breeding purposes. The organ was enlarged to three times its normal size and on section was found to contain very little normal tissue. *Bacterium abortus* Bang was isolated by culture and guinea pig inoculation.

Serologic reactions:

Date	Agglutination						C. F.			
December 1, 1923	+	+	+	+	+	+	+	+	+	
December 12, 1923	+	+	+	+	+	+	+	+	+	
December 22, 1923	+	+	+	+	+	+	+	+	+	
January 2, 1924	+	+	+	+	+	+	+	+	+	
January 25, 1924	+	+	+	+	+	+	+	+	+	
February 4, 1924	+	+	+	+	+	P	+	+	+	
March 3, 1924	+	+	+	+	P	P	+	+	+	
April 1, 1924	+	+	+	+	—	—	+	+	+	
May 1, 1924	+	+	+	P	—	—	+	+	+	Weak
June 3, 1924	+	+	P	P	—	—	+	+	+	Weak
July 14, 1924	+	+	—	—	—	—	+	+	—	

After removal of the affected testicle the bull was kept as sire for the abortion-infected herd. This was done to check his efficiency and to note possible involvement of the genital organs with *Bacterium abortus* Bang infection. Examination of the semen showed the presence of large numbers of active spermatozoa. There was no evidence of cellular changes. It is of interest to note that the agglutination titre decreased steadily after the removal of the infected testicle, thus indicating that no new focus of infection had been established in the opposite testicle, epididymis or seminal vesicles. The animal was sold for slaughter on July 22, 1924. No bacteriological examination of the genitalia was made.

Bull 28.

Born, October 5, 1922. Dam was a negative reactor for *Bacterium abortus* Bang infection.

The serologic tests on this individual were negative up to and including August 13, 1923.

On August 17, 1923, this animal was given an intratesticular injection with 0.2 cc of a saline suspension of *Bacterium abortus* Bang. With the exception of a mild local inflammation involving the left testicle the individual apparently suffered no ill effects.

Serologic tests at weekly intervals, up to and including October 17, 1923, gave negative evidence of infection.

On October 18, 1923, this animal was given an intratesticular injection with 0.5 cc of a saline suspension of *Bacterium abortus* Bang.

Serologic reactions:

Date	Agglutination						C. F.		
October 18, 1923	—	—	—	—	—	—	—	—	—
October 28, 1923	+	+	+	+	+	+	+	+	+
November 8, 1923	+	+	+	+	+	+	+	+	+
November 15, 1923	+	+	+	+	+	+	+	+	+
December 12, 1923	+	+	+	+	+	+	+	+	+
December 22, 1923	+	+	+	+	+	—	+	+	+
January 2, 1924	+	+	+	+	+	—	+	+	+
January 25, 1924	+	+	+	+	P	—	+	+	+
February 4, 1924	+	+	+	+	—	—	+	+	+

Semen examinations showed spermatozoa which were inactive although present in fairly large numbers. The animal itself, while appearing to be in good health, failed to show sexual activity and was therefore slaughtered on February 7, 1924, to determine the extent of *Bacterium abortus* Bang infection of the genitals by direct culture and guinea pig inoculation. Grossly the testicle showed no apparent change with the exception of a small number of adhesions between the tunica and testicle proper adjacent to the point of injection. Culture and guinea pig inoculation failed to show the presence of *Bacterium abortus* Bang infection.

Bull 32.

Born, October 15, 1922. Dam reacted at a dilution of 1-200.

Frequent serologic tests, up to and including June 3, 1924, showed negative agglutinin titre for *Bacterium abortus* Bang infection.

On June 16, 1924, this animal was given an intratesticular injection with 0.5 cc of a saline suspension of *Bacterium abortus* Bang. It was our desire to note the period of time which would elapse between the establishing of an active focus of infection and the presence of a well-defined agglutinin titre. Therefore, commencing on June 19, 1923, the animal was bled daily until the agglutinin titre reached 1-1000. The results of the serologic tests follow:

Date	Agglutination						C. F.		
June 19, 1923	—	—	—	—	—	—	—	—	—
June 20, 1923	+	—	—	—	—	—	—	—	—
June 21, 1923	+	+	—	—	—	—	+	—	—
June 22, 1923	+	+	P	—	—	—	+	P	—
June 23, 1923	+	+	+	—	—	—	+	+	+
June 24, 1923	+	+	+	+	—	—	+	+	+
June 25, 1923	+	+	+	+	P	P	+	+	+
June 26, 1923	+	+	+	+	+	+	+	+	+

The agglutinin titre held at 1-1000 until the animal was slaughtered on January 13, 1925.

This bull succesfully bred a cow, February 19, 1924. Cow and resulting calf showed no evidence of infection.

Semen was procured on July 20, 1924, and injected into two guinea pigs. Both pigs died 24 hours following injection. Death appeared to be due to toxemia.

Semen was again procured on July 25, 1924. The material was diluted in twenty parts of normal saline and 2 cc were injected into each of two guinea pigs. Autopsy and culture of these pigs on August 28, 1924, failed to show the presence of *Bacterium abortus* Bang.

Semen in the same dilution and amount was injected into two guinea pigs on September 18, 1924. Autopsy and culture of the guinea pigs on October 14, 1924, failed to show the presence of *Bacterium abortus* Bang.

Animal was slaughtered on January 13, 1925. The testicles, epididymides, seminal vesicles, urethra, and regional lymph-glands were procured for culture and guinea pig inoculation. None of these tissues showed abortion infection. The right testicle which had received the injection on June 16, 1924, was atrophic. The tunic was very much thickened and closely adherent to the testicle proper. The epididymis seemed to have been almost entirely replaced by scar tissue, with only a small portion of the tail remaining. The testicle proper was extremely fibrous.

Bull 52.

Purchased, March 25, 1924.

Agglutination reaction negative on April 1, 1924.

Given an intratesticular injection with 0.5 cc of a heavy saline suspension of *Bacterium abortus* Bang on April 18, 1924. As in the case of bull 32, the animal was bled daily and serologic tests run to note the agglutinin titre following active infection. The results of the serologic tests follow:

Date	Agglutination						C. F.		
April 21, 1924	P	—	—	—	—	—	—	—	—
April 22, 1924	+	P	P	—	—	—	P	—	—
April 23, 1924	+	+	+	+	—	—	+	+	—
April 24, 1924	+	+	+	+	P	—	+	+	+
April 25, 1924	+	+	+	+	P	—	+	+	+
April 27, 1924	+	+	+	+	+	+	+	+	+
April 28, 1924	+	+	+	+	+	+	+	+	+

The agglutinin titre continued at 1-1000 until November 3, 1924. On December 8, 1924, the titre dropped to 1-500 and on January 7, 1925, to 1-200. This titre has remained unchanged until the present time, namely August 1, 1925.

A specimen of semen was obtained on June 18, 1924. Only a small amount was procured. The spermatozoa were numerous but rather sluggish and soon became inactive. One-half cc was injected intraperitoneally into each of two guinea pigs. The pigs died within 24 hours, death being due to toxemia.

Semen was procured on July 25, and September 18, 1924. After diluting in twenty parts of saline, one cc was injected into guinea pigs. Autopsy and culture failed to show the presence of abortion infection.

The bull now heads our abortion-infected herd. He is an efficient sire and shows no clinical evidence of pathological involvement of any of the genital organs.

Group IV

This group comprises two heifers whose sera had given negative reactions for *Bacterium abortus* Bang infection. In order that we might determine the danger of the spread of abortion infection through the semen at the time of service, these animals were given vaginal douches of varying quantities of a saline suspension of *Bacterium abortus* Bang. No attempt was made to introduce the infective material through the os. The detailed data follow:

Cow 21.

Born, May 2, 1922.

On May 21, 1923, 30 cc of a heavy saline suspension of *Bacterium abortus* Bang was injected into the urethra and vagina.

Serologic reactions:

Date	Agglutination						C. F.		
May 28, 1923	—	—	—	—	—	—	—	—	—
June 4, 1923	+	P	—	—	—	—	—	—	—
June 11, 1923	+	P	—	—	—	—	—	—	—
June 19, 1923	P	—	—	—	—	—	—	—	—
June 25, 1923	P	—	—	—	—	—	—	—	—
July 9, 1923	P	—	—	—	—	—	—	—	—

On July 19, 1923, 30 cc of a heavy saline suspension of *Bacterium abortus* Bang was again injected into the urethra and vagina.

Serologic reactions:

Date	Agglutination						C. F.		
July 16, 1923	P	—	—	—	—	—	—	—	—
July 23, 1923	+	P	—	—	—	—	P	—	—
July 30, 1923	+	P	P	—	—	—	+	P	—
August 6, 1923	+	P	—	—	—	—	+	—	—
August 14, 1923	+	P	—	—	—	—	—	—	—
August 21, 1923	+	—	—	—	—	—	—	—	—
August 29, 1923	—	—	—	—	—	—	—	—	—
September 4, 1923	P	P	—	—	—	—	—	—	—
September 13, 1923	—	—	—	—	—	—	—	—	—

Note: The serologic reactions have remained negative from September 13, 1923, to the present time (August 1, 1925).

Calved normally on September 18, 1924. The fetal membranes were expelled within 24 hours. Colostrum and placental material failed to show abortion infection.

Animal now in the seventh month of her second gestation period.

Frequent examination of milk samples has failed to reveal *Bacterium abortus* Bang infection.

Cow 35.

Serologic reactions negative from date of purchase.

On May 21, 1923, 30 cc of a saline suspension of *Bacterium abortus* Bang was injected into the urethra and vagina.

Serologic reactions:

Date	Agglutination						C. F.		
May 28, 1923	—	—	—	—	—	—	—	—	—
June 4, 1923	+	+	+	+	—	—	+	+	+
July 9, 1923	+	+	P	—	—	—	+	+	+
August 6, 1923	+	+	P	—	—	—	+	+	+
September 4, 1923	—	—	—	—	—	—	—	—	—
November 8, 1923	+	+	P	—	—	—	+	+	—

Calved normally on December 12, 1923. Fetal membranes were discharged within 12 hours.

Calved normally on May 15, 1925. Membranes were expelled shortly following calving.

Since December, 1923, the serologic reactions have been negative.

Examination of the colostrum, placental material, and milk failed to show the presence of *Bacterium abortus* Bang.

Discussion

At the present time, when the successful control of infectious abortion depends upon the recognition of the infected animal, it becomes increasingly important that we have clearly in mind those factors concerned in the spread of the disease. Experimental evidence has shown that approximately thirty per cent of female animals reacting to the serologic tests actually eliminate the organism and are a source of danger as spreaders. In the female the organism is eliminated from the genital organs and udder and, therefore, particular attention has been directed toward the proper disposal of these discharges. The abortion-infected male becomes an economic problem only insofar as he plays a part in the spread of the disease and consequently varying degrees of importance have been attached to those bulls giving positive serologic evidence of infection. If the infected male is a source of danger in spreading abortion infection, the channel of elimination must be the genitalia and the semen the vehicle. The question therefore follows, Does the organism show a predisposition to harbor itself in the genitalia of the male? If it does not, then many males giving a positive serologic test for abortion infection might be used for breeding purposes.

It was to study the involvement of the genitalia of abortion-infected males, and the susceptibility to infection through various

channels that the work recorded under groups I and II was undertaken. Group I was infected solely by intravenous injection to learn if organisms, known to circulate in the blood stream, would involve any portion of the genital tract. Referring to table I, it will be observed that the agglutinin titre had decreased rapidly in each of the four animals the second and third months following each infection. A correct interpretation of these results would indicate that we had failed to establish an active focus of infection in a single individual and it is therefore not surprising that autopsy and culture failed to show involvement of the genitalia. It is to be regretted that the experiment had to be terminated prematurely.

In group II, consisting of four animals, infection was attempted by means of the natural channels, namely per os and by way of the urethra. The infective material of fetal origin always contained viable abortion bacilli, while the organisms given in saline suspension were of known pathogenicity. Bull 23 gave an agglutinin titre of 1-1000 only after being drenched four times. Bulls 27 and 29 failed to give an agglutinin titre until two drenches were given and the titre never exceeded 1-100, even after four drenches. It would appear from these observations that the male is relatively resistant to infection by way of the digestive tract. We were unable to infect bulls by douching the prepuce with abortion bacilli or by direct injection into the urethra. While this would tend to indicate that the male is not apt to become actively infected by contamination of the penis at service, it does not preclude the possibility of his acting as a passive carrier of infection to other females.

It will be observed that we were unable to demonstrate the presence of *Bacterium abortus* Bang in any of the animals giving serologic evidence of infection, such infection having been induced by drenching or the intravenous infection of the organisms. The observations in a small way support the findings of Buck, Creech and Ladson, on the infrequency of infection of the genitalia of reacting bulls.

While only a small percentage of bulls react positively for *Bacterium abortus* Bang infection, and we have been unable experimentally to induce infection of the genital organs through natural channels, clinical evidence has shown without doubt that a male animal may show active infection of the genital organs. Such bulls have been accused, on the basis of clinical evidence, of introducing abortion infection into an otherwise

clean herd. Such observation would tend to indicate the uniform presence of abortion bacilli in the semen and, further, that the female is readily infected by way of the vagina.

Examination of the semen of the four bulls of group III, known to harbor active abortion infection in the testes, failed to show the presence of the organism. Further, cultures of the genitalia of three of the individuals failed to show infection in any portion of the genital tract, including the point of original infection, which in each case gave gross evidence of a chronic inflammatory process and which clinically would be said to be infected. It has been a matter of general observation that bulls discharging abortion bacilli in the semen give clinical evidence of severe inflammatory disturbances in either the testicle proper, epididymis or seminal vesicles, and it therefore becomes a matter of prime importance to examine carefully the reacting male for the presence of clinical evidence of infection.

We have in a few instances isolated *Bacterium abortus* Bang from the genital organs of bulls naturally infected. There is not the least doubt that such infection may occur. It should be kept clearly in mind that we are dealing exclusively with *Bacterium abortus* infection and that we are not writing of infections due to micrococci, streptococci, or other pyogenic bacteria. Granting that a small percentage of reacting bulls do discharge *Bacterium abortus* Bang in the semen, there is much experimental evidence to question their ability to infect the female at the time of service, inasmuch as the female is infected with difficulty by way of the vagina. True, infection of the female may occur as readily through food contamination with abortion-infected seminal discharges as by any other means. In instances of this kind it is not a breeding problem but one of improper management and its occurrence can be precluded in the well-managed herd.

The small amount of data on this angle of the problem is presented as group IV, in which there was introduced into the urethra and vagina of two females large quantities of abortion bacilli far in excess of that met with in natural infection. A transient high agglutination titre was produced in one animal, which rapidly receded, indicating that no active focus of infection had been established. These observations were borne out by the fact that both animals have calved successfully and the organism has never been recovered after repeated bacteriologic examination, nor have these animals shown any other evidence of infection.

Conclusions

1. Bulls are not readily infected through the natural channels of infection, namely per os or by way of the urethra. This conclusion is also supported by clinical observations and serologic tests in which only a small percentage of bulls show active infection.

2. Many bulls giving a positive reaction to the serologic tests for infectious abortion do not harbor *Bacterium abortus* Bang in the genital organs.

3. Repeated examination of the semen of those bulls known to harbor the organism in the genitalia (the result of artificial infection) failed to show the presence of *Bacterium abortus* Bang.

4. Although the data presented on channels of infection in heifers are not sufficient to warrant definite conclusions, they add to the experimental evidence that heifers are not readily infected by way of the urethra and posterior vagina.

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ERADICATION OF DOURINE

The campaign for the eradication of dourine was continued in cooperation with state live stock sanitary officials and the Office of Indian Affairs, with a view to completing the suppression of this disease in the few areas in which it still existed. Infected animals were found only in Arizona and South Dakota, and with few exceptions the diseased horses were owned by Indians. Excellent cooperation was received in rounding up and testing horses belonging to Indians in the infected area in South Dakota, and fine progress was made toward completing the work in that state. In Arizona, however, it was again necessary to curtail activities because the Office of Indian Affairs did not have funds available to employ sufficient help to round up the horses for testing and to indemnify owners for the slaughter of diseased animals. (Report of Chief of Bureau of Animal Industry, 1925.)

A COMPARISON OF THE CAUSATIVE ORGANISMS OF LA MANCHA, MANQUEIRA, EUROPEAN AND AMERICAN BLACKLEG*

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INTRODUCTION

The symptoms of the disease of cattle known as blackleg are so familiar that their description is unnecessary.

In their clinical reports on diseases similar to blackleg in the Argentine, Lignieres and Bidart[1] refer to an affection which is known under the name "mancha" or "la mancha," meaning literally "the spot," so called because of the dark color of the skin over the edematous musculature. The causative organism of this condition is said by these workers to be similar in some ways to the causative organism of blackleg. Zanolli and Sordelli[2] have recently shown conclusively that the etiological factors of this disease and European blackleg are identical.

In Brazil, blackleg is sometimes referred to as "manqueira," a literal translation of the term being "lameness," or a hurt which prevents the use of the hands or the arms.

Included in these comparative studies were five strains of *C. chauvoei* isolated from field cases of blackleg occurring in various parts of the United States; three strains of the organism isolated from muscle taken from affected cattle in the Argentine; one strain received from S. H. Gaiger, F. R. C. V. S., Director, Animal Diseases Research Association Laboratory, Glasgow, Scotland; one strain isolated from a culture in meat-piece medium made directly from a case of blackleg occurring in New South Wales; three strains of the organism isolated from muscle taken from cases of "la mancha" occurring in the Argentine; and five strains of the organism isolated from samples of muscle taken from cases of "manqueira," occurring in Brazil.

DESCRIPTION OF AMERICAN STRAIN

The morphology and cultural characteristics of the five strains of *C. chauvoei* originating from cases of blackleg in the United States are described as follows:

*Presented at the sixty-second annual meeting of the American Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

The organisms occur singly or in pairs, only very exceptionally in chains, and vary somewhat in size, but average 0.5 microns in width by 3 to 4 microns in length. They often show granular staining and, after 24 to 48 hours of incubation, become pleomorphic. In young cultures, the organisms are Gram-positive (Stirling modification), but sometimes lose this characteristic in old cultures. This characteristic is much more evident when the organisms are stained directly from the animal tissues. They are sluggishly motile. Spores develop in 18 to 24 hours in Hibler[3] medium, and are median or terminal, elliptical in shape and larger than the diameter of the cell. The most common variation in form is the clostridial or navicular.

Impressions made of the parietal surface of the liver of guinea pigs dead of infection by these organisms show the Gram-positive bacilli occurring singly or in pairs; never in chains.

When planted in 2 per cent agar medium containing 2 per cent glucose, no growth of this organism occurs unless tissue or blood is carried over in the seeding.

In liver infusion containing 2 per cent agar, the organisms grow readily, in 18 to 24 hours forming small, smooth, elliptical or spherical colonies, which are translucent. The amount of gas produced in this medium depends on the freshness of the medium and also upon the amount of tissue or blood carried over in the seeding.

Transplanted to Hibler medium, *C. chauvoei* grows under apparent aerobic conditions with the production of gas. There is a slight cloudiness of the fluid portion of the medium, but no proteolysis of the brain tissue which may turn slightly pink. No odor except that of a faint indication of butyric acid is noted.

In litmus milk in fermentation tubes, or in test-tubes under oil or paraffin, no growth occurs whether planted by loop or by pipet.

When injected into guinea pigs, *C. chauvoei* usually produces death in from 20 to 48 hours. For some hours prior to death, there is formed, around the site of injection, a marked edematous swelling. On postmortem usually the entire abdominal and thoracic regions are hemorrhagic, some areas of the muscle being more deeply stained than others, especially in the axillary regions. There is hemorrhagic fluid present, the amount varying considerably in the different pigs used, and also a sero-gelatinous infiltration of the intramuscular tissue. There is usually only a very small amount of gas present, which is found most often in the axillary spaces. The subcutaneous lesions brighten somewhat

in color on exposure to the air. The organism can readily be recovered from the heart-blood immediately after death if the infection has not been rapidly fatal. Otherwise, it can be recovered in four to five hours.

The protection afforded guinea pigs by the injection of small amounts of antiblackleg serum against these five strains is shown in table I.

TABLE I—*Protection of guinea pigs by antiblackleg serum against American strains (0.5 cc of culture)*

PIG	SERUM	STRAIN	RESULT
1	1 cc	1	No reaction
2	1 cc		No reaction
3	Control		Dead—24 hours
4	1 cc		No reaction
5	1 cc	2	No reaction
6	Control		Dead—30 hours
7	1 cc		1x swelling
8	1 cc	3	No reaction
9	Control		Dead—48 hours
10	1 cc		No reaction
11	1 cc	4	No reaction
12	Control		Dead—24 hours
13	1 cc		No reaction
14	1 cc	5	No reaction
15	Control		Dead—20 hours

ARGENTINE STRAINS

Guinea pigs injected subcutaneously with small portions of the muscle tissue received from the Argentine died in from 20 to 48 hours, with typical symptoms and postmortem lesions of blackleg. Liver impressions showed Gram-positive bacilli, similar in size and shape to *C. chauvoei*, occurring singly and in pairs. No chains were noted. An organism identical with *C. chauvoei* was recovered in pure culture from the heart-blood of all the guinea pigs.

Protection of guinea pigs by small amounts of antiblackleg serum against these strains was complete, most of the controls dying in 20 to 48 hours, with symptoms and postmortem lesions typical of blackleg. The results of these tests are shown in table II.

EUROPEAN STRAIN

This strain was received as a pure culture in meat-piece medium. Transfers to Hibler medium, 2 per cent glucose agar,

TABLE II—*Protection of guinea pigs by antiblackleg serum against Argentine strains*

PIG	SERUM	CULTURE (cc)	STRAIN	RESULTS
1	0.5 cc	0.25	1	No reaction
2	0.5 cc	0.5		No reaction
3	0.5 cc	1.0		No reaction
4	Controls	0.25		1x swelling
5		0.5		Dead—28 hours
6		1.0		Dead—20 hours
7	0.5 cc	0.25	2	No reaction
8	0.5 cc	0.5		No reaction
9	0.5 cc	1.0		No reaction
10	Controls	0.25		2x swelling
11		0.5		2x swelling
12		1.0		Dead—30 hours
13	0.5 cc	0.25	3	No reaction
14	0.5 cc	0.5		No reaction
15	0.5 cc	1.0		No reaction
16	Controls	0.25		2x swelling
17		0.5		Dead—48 hours
18		1.0		Dead—20 hours

2 per cent liver-infusion agar, and litmus milk produced reactions similar to those described as characteristic for the American strains.

Injections of small amounts of this culture into guinea pigs produced death in 20 hours, with typical symptoms and postmortem lesions of blackleg. Liver impressions showed the Gram-positive *C. chauvoei*, occurring singly and in pairs. No chains were noted. The organism was recovered in pure culture from the heart-blood.

The results of the immunization of guinea pigs by means of antiblackleg serum against this strain are shown in table III.

TABLE III—*Protection by antiblackleg serum against European strain*

PIG	SERUM (cc)	CULTURE (cc)	RESULT
1	1.0	1.0	No reaction
2	1.0	1.5	No reaction
3	1.0	2.0	No reaction
4	1.0	2.5	No reaction
5	1.0	3.0	No reaction
6	Controls	1.0	Dead—20 hours Blackleg
7		1.5	Dead—20 hours Blackleg

New South Wales Strain

When received, no guarantee as to purity of this culture was made. The culture had been made into meat-piece medium, directly from a field case of blackleg occurring in New South Wales.

Transfers to the differential media described above showed only a slight aerobic contamination. After death of guinea pigs injected subcutaneously with this culture, *C. chauvoei* was recovered in pure culture. The symptoms and postmortem lesions shown in the guinea pigs were those of blackleg.

Protection afforded guinea pigs by small amounts of antiblackleg serum against varying amounts of the culture was complete, with the exception of the one pig receiving the largest amount of culture. Control pigs died in 24 to 48 hours of blackleg. The results are shown in table IV.

Table IV—*Protection of guinea pigs by antiblackleg serum against New South Wales strain*

Pig	Serum (cc)	Culture (cc)	Result
1	1.0	0.1	No reaction
2	1.0	0.3	No reaction
3	1.0	0.5	No reaction
4	1.0	0.8	No reaction
5	1.0	1.0	Dead—48 hours
6	Controls	0.1	Dead—48 hours
7		0.3	Dead—24 hours
8		0.5	Dead—24 hours
9		0.8	Dead—24 hours
10		1.0	Dead—24 hours

"La Mancha" Strains

These strains were isolated from pieces of dried muscle from cattle, dead of "la mancha," by injecting small portions subcutaneously into guinea pigs, making cultures from the heart blood into Hibler medium a few hours after death had occurred.

The symptoms and postmortem lesions seen in these pigs were those of blackleg with Gram-positive bacilli, similar to *C. chauvoei*, seen in liver impressions. Transfers from cultures of the organisms, recovered from the heart-blood, to differential media, gave the same characteristics as were described for the American strains of *C. chauvoei*.

As shown in table V, guinea pigs were protected against these strains by an injection of small amounts of antiblackleg serum.

Untreated animals died with symptoms and postmortem lesions typical of blackleg.

TABLE V—*Protection of guinea pigs by anti-blackleg serum against "la mancha" strains (1.0 cc of culture)*

PIG	SERUM	STRAIN	RESULT
1	1.0 cc	1	No reaction
2	1.0 cc		No reaction
3	Control		Dead—24 hours
4	1.0 cc	2	No reaction
5	1.0 cc		No reaction
6	Control		Dead—30 hours
7	1.0 cc	3	No reaction
8	1.0 cc		No reaction
9	Control		Dead—24 hours

MANQUEIRA STRAINS

These five strains were isolated from pieces of dried muscle taken from cattle, dead of manqueira, in Brazil, by the usual method of passage through guinea pigs. Symptoms and postmortem lesions shown in these experiment animals were typical of blackleg. The organisms recovered in pure state from the heart-blood were identical in every respect with the American strains of *C. chauvoei* described above.

Guinea pigs immunized with antiblackleg serum were protected against infection by these various strains. Control pigs died in 24 to 48 hours, with symptoms and postmortem lesions typical of blackleg. The organism was recovered in pure culture from the heart-blood of all animals dying of this infection. The results of the immunization of guinea pigs with antiblackleg serum against these strains is shown in table VI.

In all of the animal protection tests, an interval of 15 hours was allowed to elapse between the injection of the antiblackleg serum and the injection of the cultures. Antiblackleg serum from one lot was used throughout these experiments. All pigs which survived were held under observation for four days, when the final results were noted.

FERMENTATION REACTIONS

In the determination of the action of these various organisms on some of the more common carbohydrates, sugar-free beef infusion, made in the usual manner, was used as the basis of the media made and tried.

To this sugar-free beef infusion were added 1 per cent peptone, 0.5 per cent sodium chlorid and the carbohydrate, in amounts

TABLE VI—*Protection by antiblackleg serum against various "manqueira" strains (2.0 cc of culture)*

PIG	SERUM	STRAIN	RESULTS
1	1.0 cc	1	No reaction
2	1.0 cc		No reaction
3	Control		Dead—24 hours
4	1.0 cc	2	No reaction
5	1.0 cc		No reaction
6	Control		Dead—24 hours
7	1.0 cc	3	No reaction
8	1.0 cc		No reaction
9	Control		Dead—24 hours
10	1.0 cc	4	No reaction
11	1.0 cc		No reaction
12	Control		Dead—24 hours
13	1.0 cc	5	No reaction
14	1.0 cc		No reaction
15	Control		Dead—24 hours

necessary to make the desired concentration. The whole was heated in flowing steam until the peptone was dissolved, when the reaction was adjusted at pH 7.6. The medium was then filtered, filled into 18 x 300 m. m. tubes, 30 cc to a tube, and autoclaved at 15 pounds pressure for 15 minutes.

On removal from the autoclave, the medium was cooled to 45° C. and immediately planted with the various strains under consideration. Transfers were all made by means of a pipet, carrying over 0.1 cc to 0.2 cc of the starter culture into each of the five tubes planted with each strain. To obtain anaerobic conditions, the bouillon was covered immediately after planting with a half-inch to three-quarter-inch layer of sterile melted paraffin. The cultures were incubated at 37° C. for 48 hours, observations being made at the end of 24 and 48 hours. Five unplanted tubes of the bouillon were covered with the paraffin and incubated along with the cultures, to act as controls on the sterility of the medium being used.

The starter cultures were carried in Hibler medium, purity being checked at each time of planting, by transfers into shake cultures of 2 per cent liver-infusion agar and 2 per cent agar medium containing 2 per cent glucose.

The carbohydrates tested in these experiments were used in concentrations of 2 per cent and 0.2 per cent.

It was found (table VII) that when bouillon under paraffin containing 2 per cent of either glucose, saccharose, levulose,

maltose, lactose, galactose, mannite, inulin, glycerin, dextrin, or salicin was planted with these various organisms, no change took place. When the concentration was reduced to 0.2 per cent (table VIII), glucose, levulose, maltose, lactose, galactose and dextrin were fermented, while no change occurred in the media containing the other carbohydrates.

TABLE VII—*Average action of various organisms in media containing 2 per cent concentrations of carbohydrates*

CARBOHYDRATE	STRAIN					
	AMER.	ARGENT.	EUROP.	N. S. W.	LA MANCHA	MANQUEIRA
Glucose	—	—	—	—	—	—
Saccharose	—	—	—	—	—	—
Levulose	—	—	—	—	—	—
Maltose	—	—	—	—	—	—
Lactose	—	—	—	—	—	—
Galactose	—	—	—	—	—	—
Mannite	—	—	—	—	—	—
Inulin	—	—	—	—	—	—
Glycerin	—	—	—	—	—	—
Dextrin	—	—	—	—	—	—
Salicin	—	—	—	—	—	—

— equals no change.

TABLE VIII—*Average action of various organisms in media containing 0.2 per cent concentrations of carbohydrates*

CARBOHYDRATE	STRAIN					
	AMER.	ARGENT.	EUROI.	N. S. W.	LA MANCHA	MANQUEIRA
Glucose	+	+	+	+	+	+
Saccharose	—	—	—	—	—	—
Levulose	+	+	+	+	+	+
Maltose	+	+	+	+	+	+
Lactose	+	+	+	+	+	+
Galactose	+	+	+	+	+	+
Mannite	—	—	—	—	—	—
Inulin	—	—	—	—	—	—
Glycerin	—	—	—	—	—	—
Dextrin	+	+	+	+	+	+
Salicin	—	—	—	—	—	—

+ equals change
— equals no change.

A comparison of the morphology and cultural characteristics of the causative organisms of blackleg in America, Europe, the Argentine, and New South Wales, and the affections known as la mancha and manqueira, lead to the conclusion that they are identical.

In addition to their pathogenesis, further evidence of their identity is shown by the fact that experiment animals, immunized by means of antiblackleg serum produced with strains of the American blackleg organism as an antigen, are protected against infection by strains of these various organisms.

Still further evidence of the identity of the causative organisms of manqueira and blackleg is a recent report received from Dr. J. H. McNeil, of Trenton, N. J., who states that, during his sojourn in Brazil several years ago, vaccination with the usual blackleg products in outbreaks of this disease was followed by good results.

Conclusions

1. Morphological and cultural comparisons of the causative organisms of blackleg in America, Europe, the Argentine, and New South Wales, and the affections known as la mancha and manqueira, show that they are identical.

2. The identity of these organisms is further shown by their pathogenesis and by the protection against infection of guinea pigs treated with antiblackleg serum made with the American strains of *C. chauvoei* as an antigen.

3. Still further evidence of the identity of manqueira and blackleg is the report that cattle are protected against the former by treatment with the usual antiblackleg products.

Acknowledgments

Acknowledgement is hereby made to Dr. Alfredo Sordelli, Director, Instituto Bacteriologico, Departmento Nacional de Higiene, Buenos Aires, Argentina, who kindly furnished specimens from cases of blackleg, la mancha, and manqueira; to S. H. Gaiger, F. R. C. V. S., Director, Animal Diseases Research Association Laboratory, Glasgow, Scotland, for the culture of *C. chauvoei* originating in that country; to Dr. S. Dodd, Department of Veterinary Science, University of Sydney, Sydney, N. S. W., for the Australian strain of *C. chauvoei*; also to Dr. J. H. McNeil, of Trenton, N. J., for information as to the symptomatology of la mancha and manqueira.

Acknowldgement is also made to Miss Margaret E. Jones and Mr. E. A. Tompkins, of this laboratory, who performed the greater part of the detail work necessary in carrying out this project.

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Discussion

Dr. Adolph Eichhorn: The subject of blackleg has been a matter of discussion for many, many years, and I believe it is still somewhat in doubt.

Recently, at a conference of the Central European Powers, the veterinarians of those countries discussed the subject at great length, in order to establish whether all cases of so-called blackleg are really induced by the organism of blackleg, *C. chauvoei*, and, furthermore, whether there are not any other organisms capable of producing symptoms similar to blackleg.

In listening to the paper of Dr. Schlingman, I know he is inclined to accept the theory that all organisms isolated in the different countries induce the so-called blackleg, and are more or less identical with our strain in the United States. Now, that is of great interest, and I wonder whether he has worked with a sufficient number of strains from the respective countries to justify such a sweeping conclusion.

From the report of that conference I just cited, it appears that in different parts of the European countries, outbreaks of blackleg are caused by at least two principal groups of organisms, and a third group also, which, in a small percentage of cases, is responsible for the disease. If I recall correctly, in some part of Germany, approximately fifty per cent was caused by the organism *C. chauvoei*, and about forty per cent by the Kitt organism, and the remaining ten per cent by one or two other organisms resembling somewhat the blackleg organism, but which they classify as not identical with the two blackleg organisms.

The fact that Dr. Schlingman succeeded in protecting with serum animals which were infected with this organism, is, of course, of interest, but it also creates some doubt in my mind whether we could accept that as conclusive for considering the organisms as being actually true blackleg organisms.

There is some possibility that we may deal with organisms where we might have some group relation, but when it comes to the final analysis, there might be some slight difference in those organisms.

We know when we study the antigenic qualities of trypanosomes, for instance, we find that the blood of horses affected with dourine will fix the antigen prepared from trypanosomes of other diseases; that is, those of sleeping-sickness and even those of the non-pathogenic types. This proves that we deal here with a group reaction, which might also be the case to some extent with the anaerobic organisms causing infections simulating those of blackleg and, for this reason, I believe that the number of strains tested by Dr. Schlingman is not sufficient to draw sweeping conclusions that we are dealing with an identical disease in all the different countries.

Dr. Hugo Hartnack: When I was an assistant in a bacteriological state institute, and also as a practitioner and state veterinarian, I had occasion to come in close contact with the blackleg question. The blackleg situation in Germany differs from the situation here, inasmuch as the state grants indemnity for every animal that dies, showing blackleg. However, in each case, a bacteriological test is required. When an animal has died in Germany, with well-marked symptoms of the real blackleg, culturally revealing anaerobic organisms morphologically identical with the blackleg bacillus but differing in the pathogenicity on laboratory animals, no indemnity for such animal is paid. I do not know conditions in this country, but on account of the above-named situation, practitioner as well as owner is brought in a rather peculiar situation. It is not always possible to incriminate one kind of anaerobe as the real cause of the disease which appears as blackleg. I think it more practical to consider the clinically identical diseases under the heading blackleg, and as soon as it is possible or necessary, to distinguish them after the specific cause, as *Bacillus chauvoei* or Ghon-Sachs bacillus infection, or with the name of any other bacillus which may cause the well-defined complex of symptoms named blackleg.

Dr. F. W. Wood: Personally, I am quite interested in this blackleg discussion, but I do not agree with the gentlemen to the effect that blackleg is a group disease. I think we have distinct diseases that may present, from a clinical standpoint and a postmortem standpoint, the symptoms of blackleg. I do agree with Dr. Schlingman that blackleg is caused by *C. chauvoei*. Now,

other infections will cause young cattle to die with symptoms of blackleg, but they show a different postmortem picture; the bacteriological findings are distinct, but I can see no cause for questioning the authenticity of blackleg at all on the ground that animals may die of other infections resembling blackleg. I know in examining specimens from the Pacific slope, we occasionally isolate an organism other than blackleg from a supposed blackleg case. That does not mean, however, that blackleg is not a distinct and specific infection.

DR. EICHHORN: I do not mean to infer that true blackleg is not a specific disease. What I mean to say is that we have many times cases resembling typical blackleg which are taken by the practitioner as blackleg and which study of the organisms causing the particular disease will not prove in all cases to be true blackleg. That is the point I want to leave with you, and that has been conclusively proved by the investigators of the different countries.

Of course, we all know that the true blackleg organism causes a specific disease of blackleg, and that the great majority of cases of blackleg occurring in the United States are truly blackleg but, nevertheless, we can not entirely ignore the fact that, in some instances at least, conditions simulating blackleg develop which are not caused by the true blackleg organism. Furthermore, it is my opinion that the occasional reported failures of vaccinations are due to this fact. Inasmuch as an absolute distinction on clinical and postmortem examination is well-nigh impossible, and unless careful bacteriological examination is made, a differentiation of this condition can not be established with certainty. This condition is also being recognized by some of the investigators in foreign countries, and only recently, in a publication by a prominent Swiss veterinarian, it has been stated that the reason for occasional failures from the vaccination with blackleg filtrates is due to the fact that other anaerobes might be responsible for a condition simulating blackleg, against which the filtrate prepared from the blackleg organism will not have an immunizing effect.

DR. SCHLINGMAN: I do not mean to say that all cases which show symptoms of blackleg are due to *C. chauvoei*. I realize that there are, as you say, some cases of infection in cattle which do simulate blackleg, and they may be caused by some separate and distinct organisms.

In regard to the statement of Dr. Hartnack, I want to say that I found that the American strain—*C. chauvoei*—will not produce death when injected into rabbits. A rabbit is not susceptible to the injection of *C. chauvoei*.

DR. E. A. CAHILL: Just a little practical side in connection with this discussion. Most of us have read the articles by a certain professor who, for many years, has insisted that the blackleg organism in Argentina was different from the blackleg organism in the United States. He maintained that for a number of years, and we have become very much accustomed to seeing this contention in our American literature. A few years ago, American firms succeeded in starting the sale of blackleg aggressin in South America. Shortly afterwards, the French and Germans also started to sell blackleg products in South America. I talked to a number of men on my recent visit to that country, and they told me it made no difference to them whether they bought an American product, a native product, or a European product; each seemed to protect equally well. When these men were ready to vaccinate, they bought the aggressin that was available, and from a practical standpoint it worked out very satisfactorily.

DR. EICHHORN: I would like to know whether the natural aggressin was used, or the artificial?

DR. CAHILL: The natural.

DR. EICHHORN: There is no doubt in my mind that the natural aggressin possesses immunizing properties which are not contained in the artificial aggressin. In the artificial product, the pure culture of blackleg organism is utilized, and while in the production of the natural aggressin a pure culture of blackleg organisms is injected into the animal for the purpose of producing the aggressin, nevertheless the fact that during the development of the disease the lowered resistance may also induce other anaerobic organisms to

participate in the disease process, which makes the natural aggressin, at least to some extent, an immunizing product against the related anaerobes. This makes plain the fact that it is very unusual to hear of vaccination failures from the natural aggressin, whereas from the artificial aggressin, no such uniformly good results are available.

DR. SCHLINGMAN: In regard to the natural aggressin and the filtrate or the artificial aggressin, it has been my experience when cattle are injected with relatively large amounts, that is, about five cubic centimeters of pure cultures of these American strains I have described, into the muscular tissues of the right or left hind limb, death usually occurred within thirty to forty-eight hours, and those cattle could be allowed to lie for twelve to fourteen hours and the organism recovered with very little difficulty. I also found in some work which I have been carrying on that the artificial aggressin made by using these cultures is equally as protective as the natural aggressin.

DR. L. R. VAWTER: In the last few years, we have encountered losses in cattle in the area south of Reno, and another loss in the central portion of the State, and I want to mention particularly this one loss that occurred about a year ago. We laid the cultures aside as the pathogenic characteristics did not coincide with blackleg. The general opinion was that it was blackleg, and we asked for more time. My laboratory assistant took the thing up and worked it out, and concluded that the infection in this outbreak, that occurred a year ago, was blackleg. It manifested a far less extensive intramuscular hemorrhage, and in many ways did not resemble blackleg, but after comparing the cultural and fermentation characteristics, we are of the belief it was *C. chauvoei*. However, we are taking into consideration the pathogenic differences of the organism with which we briefly worked.

HITTING AT CRUELTY

It is gratifying to note the adoption of a resolution by the American Veterinary Medical Association to the effect that no dog whelped after January 1, 1928, shall be eligible for a prize if shown with cropped ears.

This should very shortly put an end to the practice, since it strikes at the root of the matter—the competition of crop-eared dogs at bench shows. It is pleasing that the veterinarians—the men who made money out of the business of ear-cropping—have had the good sense to wipe out the stain on their profession of what they have always termed "illegitimate surgery."

The United States at last is to take its place alongside of England in this regard. British sportsmen thirty years ago barred crop-eared dogs from the bench shows under the English Kennel Club rules, holding the practice to be cruelty and conducive to harmful physical effects on the dog. Since the veterinarians have taken the position that their efforts should be to relieve pain rather than to cause it, local kennel clubs and all real friends of dogs should get in line to stop the savage practice immediately. Dogs with ears are just as handsome as dogs with parts of ears. The knife cannot improve on nature in this respect.

(Peoria, Illinois, *Star*).

RECENT STUDIES ON ICTERO-HEMOGLOBINURIA OF CATTLE*

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HISTORICAL

Ictero-hemoglobinuria, colloquially termed "red water disease" or "hemorrhagic disease" of cattle, has been the subject of rather extensive study in the districts where it occurs, during the last ten or fifteen years.

Meyer[1], Mack and Records,[2] Iverson,[3] Records and Vawter,[4] and Matte[5,6,7,8,9,10] have published articles dealing with this disease during the last decade. So far as we know, however, no publication has appeared to date definitely establishing and describing the causative organism.

OCCURRENCE

Ictero-hemoglobinuria, or red water disease, is primarily a disease of cattle, rarely sheep. It occurs most frequently in swampy, poorly-drained areas and excessively irrigated pastures, being most prevalent during the summer and early fall. Geographically the disease is definitely known to occur only in the mountain valleys of low to moderate elevation in the Sierra Nevada and Coast ranges in the United States, and the Andes in Chile, South America.

CHARACTERIZATION

Ictero-hemoglobinuria is characterized by sudden onset, rapid course, high temperature, hemoglobinuria and occasionally bowel hemorrhages. Death usually occurs in twenty-four to thirty-six hours after the first appearance of definite symptoms.

Postmortem examination reveals bloody discharges from the natural body openings. A profusion of hemorrhages occurs on the mucous membranes, subcutis and serous surfaces of the viscera and pleura. Hemoglobinuria is constantly observed. One large hemorrhagic infarct is invariably found in the liver, usually located on the upper or lower extremities of the parietal surface.

*Presented at the sixty-second annual meeting of the American Veterinary Medical Association, Portland, Oregon, July 21-24, 1925.

A complete description of the clinical symptoms and post-mortem lesions may be found in publications by Meyer and Records and Vawter.

Bacteriology

Since the publication of our paper[4] entitled, "Ictero-hemoglobinuria in Cattle," presented at the 1921 meeting of this Association, at Denver, special attention has been given to the anaerobes found in the tissues of cattle and sheep dead of the disease or killed for autopsy.

Fig. 1. Bacilli in sinusoids of liver infaret.

1922 the presence of a hitherto unidentified microorganism was suspected during the course of bacteriological examination of tissues obtained from cattle and sheep.

A large, Gram-negative, sporulating bacillus was constantly observed in the anaerobic cultures during the first twenty-four hours of incubation and in stained smears and tissue sections from the liver infarct. Subsequent examination of the original culture, after forty-eight hours of incubation, disclosed almost complete disappearance or total absence of this bacillus. Later,

methods were developed which made it possible to isolate this organism and establish it permanently on artificial media with almost uniform success when suitable material was available for culture. It is this organism which we believe we have definitely established as the etiological agent of ictero-hemoglobinuria, and which we will describe in detail in this paper.

Six strains of this anaerobe, including the first two strains isolated two years ago, were selected for a study of morphological, cultural and physiologic characteristics. All strains were subjected to the deep-agar-shake method to verify the purity of the cultures. Well-isolated colonies were picked and seeded in beef-heart, peptic-digest liver-broth. The beef-heart cultures were again seeded in deep agar. This procedure was repeated four times and we believe the cultures used are pure strains of the anaerobe under consideration.

The Manual of Methods for Pure Culture Study of Bacteria, issued by the Society of American Bacteriologists,[11] and Bergey's Manual of Determinative Bacteriology[12] were used as guides insofar as possible.

MORPHOLOGY

The bacilli are long rods occurring singly and in pairs. Chains of four or five individuals are sometimes observed in recently isolated strains or old strains grown on media containing blood or serum.

The length varies from 3 to 5.6 microns, the average being 4.5 microns. The width varies from 1 to 1.3 microns, the average being 1.1 microns. The ends are rounded in case of single bacilli, but truncate when in chains. Capsules have not been demonstrated either in tissue preparations or cultures.

Endospores are present and situated either terminal or subterminal. They are oval or slightly elongated. The walls are thick. Spores are commonly observed in the first few generations of recently isolated strains but maintenance on artificial media seems to cause them gradually to lose their sporulating ability. The use of media containing blood or serum tends to restore sporulation. Globoid spore forms have been observed in tissue sections and in cultures containing blood or serum. Motility is sluggish, by means of long, peritrichous flagella, varying from six to sixteen in number.

Gram-stain reactions were observed with two staining methods. Method 1 is a standard method,[13] used in this laboratory for the

past ten years. Method 2 is described by Hucker.[14] Three types of culture media were used in this observation: beef-heart, peptic-digest liver-broth,[15] peptic-digest liver-broth[16] enriched with raw rabbit-liver and sealed wtih petrolatum paraffin,[17] and the same medium unsealed in 200 x 25 mm. tubes. Examinations were made at six-hour intervals, beginning at the twelfth hour during the first thirty-six hours, and at intervals of twelve hours thereafter.

Gram stain was negative to method 1 in raw-rabbit-liver-enriched peptic-digest broth cultures, sealed and unsealed, from

FIG. 2. Twenty-four-hour culture of *C. hemolyticus bovis*.

the twelfth hour of incubation and remained constant for five days.

Beef-heart, peptic-digest cultures were Gram-positive until the eighteenth hour; then Gram-negative forms were observed and practically all bacilli were Gram-negative at the twenty-fourth hour.

Method 2 (Hucker) demonstrated the bacilli as Gram-positive in all types of cultures used up to the twenty-fourth hour of incubation. Both Gram-positive and -negative forms then

appeared and persisted throughout the series of observations.

It is our belief that method 1 is more satisfactory for early differentiation, as the presence of this bacillus can be detected while the culture is young and before other more slowly-growing microorganisms gain the majority.

Cultural Characteristics

Anaerobic conditions must be maintained for growth. Peptic-digest broth plus raw rabbit-liver, sealed with petrolatum paraffin, produces a very rapid, luxuriant growth, causing complete clouding in eight to twelve hours of incubation at 37° C. Varying amounts of gas with a cheesy odor are produced, usually enough to raise the seal four centimeters and occasionally blow the cotton plug.

Autoagglutination begins as early as the twelfth hour of incubation and continues until clearing of the broth takes place in thirty-six to ninety-six hours. Viability is not maintained longer than a few days in sealed cultures.

Growth in unsealed, tall tubes, 200 x 25 mm., of the same medium, is similar to that in sealed tubes, except that complete clouding of the broth does not usually occur until the twelfth hour. Active growth persists longer and autoagglutination does not occur until after seventy-two to ninety-six hours.

Beef-heart, peptic-digest liver-broth, unsealed, produces a slower and less luxuriant growth, attaining the maximum in twenty-four to thirty-six hours. Moderate gas production occurs, but often is not noticed unless the deeper meat particles are disturbed. Autoagglutination of the bacilli in fluffy masses around the meat particles in the bottom of the tube occurs after thirty-six to forty-eight hours. Slight reddening of the meat particles occurs in cultures as early as the twenty-fourth hour but never becomes prominent; blackening does not occur. The formation of amino-acid crystals has never been observed in meat cultures regardless of age. Proteolytic action does not occur in cultures incubated as long as three months.

Viability is maintained for long periods in beef-heart, peptic-digest broth.

Two per cent agar slants, made up either from ordinary meat broth or peptic-digest broth, enriched by the addition of five to seven per cent, sterile, defibrinated, rabbit blood, incubated anaerobically by the sodium hydroxide-pyrogallic acid method of Hall,[18] produce a light surface growth in twenty-four hours.

Hemolysis of blood-agar is diffuse and complete after twenty-four hours of incubation.

The deep-agar method of Hesse[19] has been used in obtaining pure cultures and for comparative study of colony types produced by various strains. Two per cent agar in peptic-digest broth (pH 7.2) has been found superior to plain, beef-broth agar. Agar is unsuitable for use two days after sterilization, vigorous boiling and agitation of the agar tubes not reducing oxygen concentration to a point tolerated by this anaerobe.

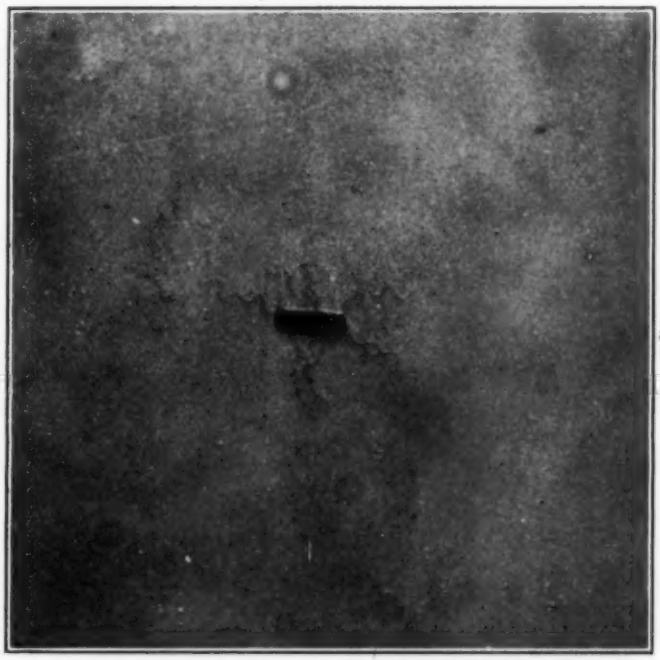

FIG. 3. *C. hemolyticus bovis*, showing flagella (Zettnow's method.)

Colonies appear in deep agar after eighteen to twenty-four hours of incubation. They are at first lenticular and homogenous, but rapidly develop an eccentric fluff on both surfaces. In six to eight hours the colonies appear as dense, woolly masses, with short, peripheral filaments. They vary from 0.25 to 0.5 mm. in diameter, according to the number in the tube. Gas is rarely if ever produced, even in heavily seeded, deep-agar cultures.

CARBOHYDRATE FERMENTATION

Carbohydrates readily available were used. The carbohydrate fermentation chart therefore does not include all such substances

TABLE I.—*Carbohydrate fermentation and cultural characteristics*

Strain	Dextrose	Levulose	Galactose	Lactose	Maltose	Saccharose	Raffinose	Arabinose	Xylose	Inulin	Salicin	Mannite	Dulcit	Glycerin	Gelatin	Milk	Coag. Serum	Meat Medium
9859	+	+	+	—	—	—	—	—	—	—	—	—	—	±	Liq.	A C	N L	N B
10029	+	+	+	—	—	—	—	—	—	—	—	—	—	±	Liq.	A C	N L	N B
11256	+	+	+	—	—	—	—	—	—	—	—	—	—	±	Liq.	A C	N L	N B
11855	+	+	+	—	—	—	—	—	—	—	—	—	—	±	Liq.	A C	N L	N B
13292	+	+	+	—	—	—	—	—	—	—	—	—	—	±	Liq.	A C	N L	N B
14414	+	+	+	—	—	—	—	—	—	—	—	—	—	±	Liq.	A C	N L	N B

\+ equals fermented.
— equals not fermented.
± equals doubtful.
Liq. equals liquefaction in 36-42 hours.
A C equals milk—no gas, acid and firm clot after 10 days.
N L equals not liquefied after 10 days.
N B equals not blackened.

known. Peptic-digest broth was exhausted of natural sugars in the usual way. Fermentation reactions were noted in one per cent carbohydrate agar and one per cent carbohydrate broth. Litmus was used as indicator.

Fermentation is confined principally to monosaccharides. Feeble activity is observed on glycerin, but only in the form of a very small bubble of gas in the tube and slight acid change. For purposes of direct comparison, we give the fermentation

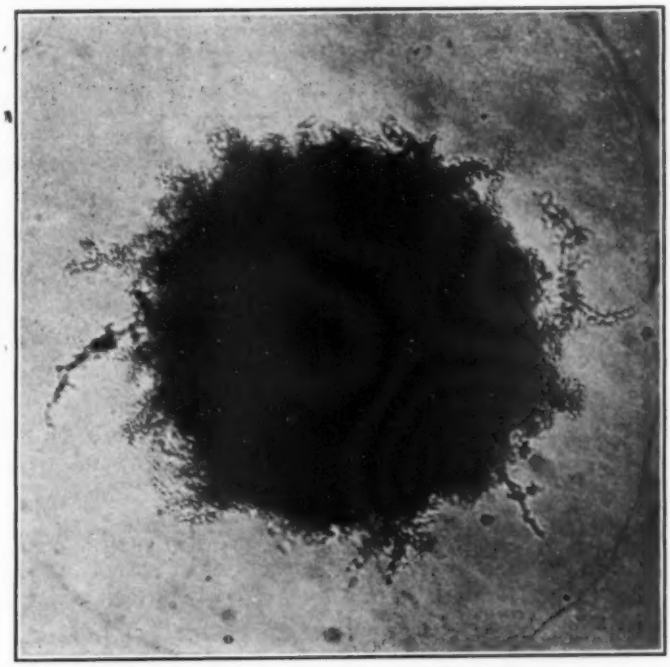

FIG. 4. Twenty-four-hour, deep-agar colony of *C. hemolyticus bovis*.

reactions of *C. chauwoei*, *C. oedematis-maligni*, *C. oedematiens*, and *C. welchii*, as given by the Medical Research Committee.[20] We recognize the fact that fermentation reactions of anaerobes reported by various investigators, Hall,[21] Goss et al,[22] Scott,[23] are subject to variation.

Several investigators call attention to the difficulty in differentiating pathogenic anaerobes by fermentation reactions alone. Comparison must also be made of their behavior in the animal body before identity can be established.

TABLE II—*Comparison of fermentation reactions and cultural characteristics of C. chauvoei, C. oedematis-maligni, C. oedematiens and C. welchii with authors' anaerobe*

	Dextrose	Levulose	Galactose	Lactose	Maltose	Saccharose	Raffinose	Arabinose	Xylose	Inulin	Salicin	Mannite	Dulcit	Glycerin	Starch	Gelatin	Milk	Coag. Serum	Meat Medium
C. chauvoei.....	+	+	+	+	+	+	O	O	O	—	—	—	—	—	O	Liq.	A C ±	N L	N B
C. oedematiens...	+	+	—	—	+	—	O	O	O	—	—	—	—	—	O	Liq.	A C	N L	N B
C. oedematis-maligni	+	+	+	+	+	—	O	O	O	–	+	–	—	—	O	Liq.	A C ±	N L	N B
C. welchii.....	+	+	+	+	+	+	O	O	O	V	—	—	—	V	+	Liq.	A C +	N L	N B
V. & R. anaerobe	+	+	+	—	—	—	—	—	—	—	—	—	—	—	O	Liq.	A C	N L	N B

+ equals fermented.
— equals not fermented.
± equals doubtful.
O equals not reported.
V equals variable.
Liq. equals liquefaction.
A C equals acid and clot.
N L equals not liquefied
N B equals no blackening.

Toxin Production

Irregular results in infecting both large and small experiment animals led to inquiry regarding the period of toxicity of cultures in various types of media. It was found early in the work that sealed cultures were toxic at the twelfth hour and unsealed cultures at the eighteenth hour. Further work was then undertaken to determine the beginning and end of the toxic period for each type of culture.

Peptic-digest, liver-broth cultures (pH 7.4) were used for the toxin tests. Whole cultures and centrifuged culture-fluid practically free of bacilli were inoculated into rabbits. Intramuscular and intravenous inoculations were performed, using whole cultures. Centrifuged culture-fluid was inoculated intravenously only.

Three culture strains of the anaerobe under consideration were used in this part of the investigation. All strains used manifested the same duration period of toxicity according to the type of culture medium employed.

The minimum lethal dose of whole, sealed, twelve-hour cultures was found to be 0.75 cc. Intravenous inoculation of rabbits with 1.5- and 2-cc doses of sealed culture demonstrated the appearance of toxicity at the eighth hour by the death of the rabbits. Activity was decreasing at the sixteenth hour, the low dose failing to kill. Both dosages were inert from that hour on. The period between inoculation and death varied from four to eighteen hours. Hemoglobinuria was found on autopsy in every instance.

Intramuscular inoculation of rabbits, using the same cultures, demonstrated toxicity from the eighth to the twentieth hour, sufficient toxin being present in a 2-cc dose at that time to establish infection and cause death. Subsequent doses were nonlethal and produced only a local lesion.

Unsealed cultures grown in tall 200 x 25 mm. tubes, showed a variation of toxicity by reason of slower and more prolonged growth. Intravenous inoculation of rabbits with 1- and 1.5-cc doses demonstrated the presence of toxin at the twelfth hour, the larger dose causing death at that time. Toxicity persisted until the twenty-fourth hour, after which the culture was inert.

Intramuscular inoculation of rabbits with 1- and 2-cc doses of unsealed culture resulted fatally with the larger dose, beginning at the twelfth hour. At the thirtieth hour, the 1-cc dose pro-

duced only a local lesion, and the 2-cc dose caused death in thirty-six hours. Subsequent doses did not cause death.

Centrifuged culture-fluid from unsealed cultures practically free of bacilli, in doses of 1.5 and 2 cc intravenously, was found to be uniformly fatal to rabbits from the twelfth to the twenty-fourth hour. Thereafter it was insufficiently toxic to affect rabbits when given in these doses.

In the light of the above results, it would seem that the pathogenicity of cultures of this anaerobe depends upon the presence of an unstable, hemolytic toxin. Cultures are lethal for rabbits four to six hours longer when injected intramuscularly than if administered intravenously. Sealed cultures, by reason of more rapid growth, manifest toxicity earlier than unsealed cultures, but presumably, for the same reason, the toxicity period is six to twelve hours shorter.

Experimental Reproduction

Guinea pigs die in eighteen to twenty-four hours following inoculation in the thigh muscle with 0.1 to 0.5 cc of toxic culture. On postmortem, an extensive, blood-stained edema is observed which involves only the areolar tissue. Gas is not produced in the lesion. Muscle at the site of inoculation is usually light-colored but not softened.

Diffuse blood-staining and perivascular hemorrhages occur on the pleura and peritoneum. The intestines are moderately distended with gas, bile-stained, or sometimes lightly blood-stained. Single or multiple minute infarcts occur in the liver. The adrenals are congested. Hemoglobinuria is frequently observed in guinea pigs not too rapidly overwhelmed by the infection. The lungs, as a rule, manifest a moderate congestion. The pericardium and epicardium are often blood-stained. The lesion fluid shows bacilli singly or in pairs. Occasional spore forms are observed. Filaments do not occur on the surface of the liver. The organism is easily recovered from the lesion fluid but only occasionally from the heart-blood.

Rabbits weighing one and one-half to two kilos die in sixteen to twenty-four hours following inoculation in the thigh muscle with 0.5 to 1.5 cc of toxic culture. The connective tissue lesions are identical with those occurring in guinea pigs. Blood-stained fluid is found in the abdominal and thoracic cavities. Generalized hemorrhagic edema of the intermuscular connective tissue occurs following intravenous inoculation. Hemoglobinuria is constantly

TABLE III.—*Experimental clinical record of animal 4782*

Female bovine; age, 1½ years; weight, 550 lbs.; good flesh. Inoculated 3 p. m., 10-21-24. Dose 40 cc of sixteen-hour, peptic-digest-broth plus raw-rabbit-liver culture, in thigh muscle

DATE	HOUR	T.	P.	R.	URINE	R.B.C.	LEUCOCYTES	REMARKS
10–21	5 a. m.	102.0	70	30	N	9,600,000	8,800	
10–21	11 p. m.	104.0	86	32	N			Recumbent—thigh slightly swollen and sensitive
10–22	9 a. m.	102.0	136	30	N			Intense edematous swelling of thigh, lameness, muzzle dry, anorexia, urine foamy
10–22	3 p. m.	103.4	130	60	N	9,800,000	11,000	General condition same as at 9 a. m.
10–23	9 a. m.	101.0	130	40	N			Slight venous pulse—marked lameness.
10–23	3 p. m.	102.4	130	30	N			Recumbent—slight venous pulse. Urine dark amber; scanty feces, dark ochre, semi-fluid and catarrhal
10–24	10 a. m.	102.4	120	36	Bloody	6,500,000		Eyes sunken, grunt when moved around, venous pulse
10–24	3 p. m.	103.0	120	20	Bloody			Eyes sunken and otherwise same as 10 a. m.
10–24	5 p. m.	102.0	136	40	Bloody	1,450,000	Not counted	Blood very pale, slow coagulation and difficult to obtain ample size drop for counting pipette
10–24	10 p. m.	97.0	160	26	Bloody			Died after about 15 minutes of agonal stage. Elapsed time from inoculation to death, 79 hours.

observed. Recovery of the organism is readily made from the heart-blood after either intravenous or intramuscular inoculation.

Considerable variation in susceptibility to this organism was found to exist in cattle. Most of the cattle used in experimental work originated in areas where the disease regularly occurs. This constant exposure to infection may account for the natural resistance of about forty per cent of the animals used. Three animals, originating on a ranch registering annual losses from this disease, failed to develop even a local lesion following inoculation.

The same strain grown in the same lot of culture medium and at the same age produced typical symptoms and death in cattle from another ranch less than one week later. Cattle in good flesh are uniformly most susceptible to experimental infection.

Seven cattle have shown typical clinical symptoms and died, following inoculation with young toxic cultures of this anaerobe. An infecting dose of 35 to 40 cc of young, toxic culture intramuscularly was used, which was probably larger than actually necessary. Three culture strains, morphologically, biochemically, and serologically identical, produced the same symptoms and postmortem lesions in cattle.

The organism inoculated was readily recovered from the lesion fluid in each case. Subsequent inoculation of two cattle and rabbits, with cultures isolated from the spleen and lesion fluid respectively, again produced the disease.

Protocols of two typical cases in experiment cattle, with a fatal termination, follow. The culture used on animal 4782 was isolated from the liver infarct of a cow dead of the disease, one week prior to the date of inoculation. The culture used on animal 4815 was maintained on artificial media three months prior to inoculation.

An animal was inoculated with a subculture made from a liver infarct of animal 4815. The clinical course in this instance was much shorter and less satisfactory than in animals 4782 and 4815. However, natural cases are occasionally observed which collapse quickly, and the exact nature of the disease is not established until postmortem examination is made. No marked change in the blood count was observed.

Animal 4815 had a red-cell count of 8,500,000 at the time of inoculation. A decrease of 1,000,000 occurred simultaneously with the appearance of hemoglobinuria. Eight hours later, a further decrease of 1,000,000 was observed. During the interval

TABLE IV.—*Experimental clinical record of animal 4815*

Female bovine; age, 1 year; weight, 500 lbs. Inoculated, noon, 12-5-24, with 40 cc of a twelve-hour, sealed, peptic-digest-broth, plus raw-rabbit-liver culture, in the right thigh

DATE	HOUR	T.	P.	R.	URINE	R.B.C.	LEUCOCYTES	REMARKS
12–5	5:30 p. m.	103.0	—	—	N	8,500,000	11,200	Reaction not noticeable
12–6	8 a. m.	102.6	100	20	N			Intense edematous swelling, lameness, anorexia
12–6	11 a. m.	103.0	100	20	N	8,750,000	26,000	Intense edematous swelling, lameness, anorexia
12–6	5 p. m.	103.6	110	15	N			Intense edematous swelling, lameness, anorexia
12–7	9 a. m.	101.6	120	15	N			Urine dark amber, feces flecked with blood, other conditions the same
12–7	12 m.	102.4	115	20	Bloody	7,500,000	22,800	Urine light bloody
12–7	3 p. m.	103.2	125	20	Bloody			Urine dark bloody, slight venous pulse
12–7	8 p. m.	102.8	130	26	Bloody	6,500,000	18,500	Urine dark bloody. Thigh swelling intense, spreading to perineum
12–8	8 a. m.	100.0	126	18	Bloody	2,300,000	27,800	Recumbent, refused to arise. Skin puncture on ear oozed blood all night. General appearance of extremis. Ears and legs cold. Visible mucous membranes anemic
12–8	10 a. m.	98.6	130	18	Bloody			Prostrate, unable to stand up. Respiration dyspnoeic
12–8	11:30 a. m.		DE	AD				Elapsed time from inoculation to death, 72 hours.

from 8 p. m. to 8. a. m., the red-cell count decreased 4,000,000. The total reduction in red blood cells amounted to seventy-three per cent at the last count made, three and one-half hours before death. A rise in the number of leucocytes occurred as the course of infection progressed.

Case 4782 had an initial red-cell count of 9,800,000. The final count of 1,450,000 shows even greater destruction, the loss in this case being eighty-five per cent.

The loss of red blood cells in experiment animals coincides with natural cases. Examination of natural cases, two to four hours prior to death, demonstrated red-cell counts ranging from 3,000,000 down to 1,500,000.

Postmortem Lesions in Experiment Cattle

Rigor mortis was quickly established. Blood-stained discharges from the nostrils, vulva, and anus were observed. The conjunctiva was either icteric or lightly blood-stained.

At the site of inoculation in the thigh, a large, tense, edematous swelling extended from the gluteal muscles to the tarsus. Dark-red fluid flowed from the lesion when incised. The odor was characteristic of that encountered in liver infarcts of natural cases. The thigh lesion showed an interstitial edema which did not extensively involve the muscle. The only muscle involvement was an area of coagulation necrosis about 15 cm. in diameter at the location of the infecting dose.

Extension of the subcutaneous edema to the perineal and inguinal spaces was commonly observed. The subcutaneous connective tissue was icteric in color, and scattered petechial hemorrhages were found in the costal area.

Varying amounts of hemoglobin-stained fluid, usually about one liter, flowed from the abdominal cavity upon incision. The usual extensive parietal peritoneal hemorrhages were not found in experimental cases. The small intestines were light red in color, due to hemoglobin staining.

The contents of the small intestines were dark brown in color, flecked with blood, and of a catarrhal consistency. The contents of the large intestines were usually very dark-colored, firm and mixed with blood.

The abomasum in some cases manifested a diffuse submucous hemorrhage. The liver was usually lighter in color than normal, slightly friable, and manifested multiple, small, light-colored infarct areas 0.5 to 1 cm. in diameter, from which the infecting

TABLE V.—*Experimental clinical record of animal 4821*

Female bovine; age 1 year; weight 550 lbs. Inoculated 10.30 a. m. with 40 cc of a twelve-hour, sealed, peptic-digest-broth plus raw-rabbit-liver culture, in the thigh muscle

DATE	HOUR	T.	P.	R.	URINE	R.B.C.	LEUCOCYTES	REMARKS
12–10	10:30 a. m.				N	10,000,000	11,600	Blood count taken at time of inoculation
12–10	5 p. m.	103.0	60	28	N			Slight lameness
12–11	9 a. m.	101.4	56	26	N			Moderate swelling of thigh and lameness—eating
12–11	1:30 p. m.	102.0	100	24	N	12,000,000	9,200	Moderate swelling of thigh and lameness—eating
12–11	5 p. m.	102.0	120	18	N			Same as above
12–12	9 a. m.	100.0	126	16	N			Intense thigh swelling—not eating
12–12	1:30 p. m.	101.0	130	18	Amber	11,000,000	16,600	Intense thigh swelling—not eating, lying down most of time, exudation of edema fluid through skin. Urine dark amber.
12–12	5 p. m.	101.8	140	28	Amber			Recumbent—would not arise
12–12	10 p. m.	96.0	160	56				Prostrate, respiration Cheyne-Stokes, heart very fast and pulse wiry
12–12	10:30 p. m.	DE	AD					Elapsed time from inoculation to death, 60 hours

organism could be recovered. The gall-bladder was always greatly distended with very dark-colored flocculent bile.

The spleen was never enlarged,but exhibited a few scattered subcapsular hemorrhages.

The kidneys were uniformly darker in color than normal, and presented numerous cortical hemorrhages of pin-head size. The adrenals were congested. The bladder uniformly contained very dark-red urine.

A two-months fetus, found on autopsy of a pregnant heifer, manifested a profusion of subcutaneous hemorrhages which practically duplicated those found in the dam.

The diaphragm did not exhibit the extensive hemorrhages commonly observed in the natural case. The parietal pleura manifested a diffuse reddening and a few aggregations of petechial hemorrhages. Small quantities (about 500 cc) of hemoglobin-stained fluid were found in the thoracic cavity.

The lungs were usually slightly reddened by diffusion of hemoglobin throughout their structure. A small quantity of hemoglobin-stained edema was usually found in the bronchi and lower end of the trachea. The bronchial mucous membrane often manifested a diffuse bloody imbibition, which also involved half the length of the trachea. The mucous membranes of the larynx and epiglottis were occasionally petechiated.

The pericardium exhibited either well-defined petechial hemorrhages or a diffuse bloody imbibition. The pericardial fluid varied in quantity, but was always hemoglobin-stained. Scattered subepicardial hemorrhages were observed. The usual diffuse subendocardial hemorrhages were observed in the left ventricle.

The lymphatic glands over the entire body manifested a slightly hemoglobin-stained appearance. The mediastinal and inguinal glands manifested congestion in the medullary portion.

The postmortem lesions in experiment cattle were regarded as satisfactory, especially considering the mode of infection.

SEROLOGICAL

The serological difference of the anaerobe described from other pathogens of the clostridium group is shown in table VI. Specific sera for comparing the pathogens were prepared either by us or procured from reliable sources. Rabbits receiving serum were injected sixteen hours prior to inoculation with the test dose of toxic culture. The culture dose used represented approximately three m.l.d. for 1600-gram rabbits.

TABLE VI.—*Serological comparison with other anaerobes of genus Clostridum*

ANIMAL	WEIGHT (GRAMS)	SERUM	SERUM DOSE (CC)	CULTURE DOSE (CC)	RESULT
5020	1450	V. & R. anaerobe	0.5	1.5	Lived
5021	1800		1.0	1.5	Lived
5022	1400	*C. oedematiens*	0.5	1.5	Dead—20 hours
5023	1300		1.0	1.5	Dead—24 hours
5024	1680	*C. welchii*	0.5	1.5	Dead—20 hours
5025	1570		1.0	1.5	Dead—20 hours
5026	1740	*C. chauvoei*	0.5	1.5	Dead—20 hours
5027	1284		1.0	1.5	Dead—20 hours
5028	1660	*C. oedematis-maligni*	0.5	1.5	Dead—20 hours
5029	1470		1.0	1.5	Dead—20 hours
5030	1460	Controls	—	0.75	Dead—20 hours
5031	1800		—	1.0	Dead—20 hours
5032	1680		—	1.5	Dead—20 hours

V. & R. equal authors' anaerobe.

Table VI demonstrates the absence of protective value in heterologous sera against toxic cultures of the anaerobe we describe. The specific relation of "red water" serum to the culture used is demonstrated by the protection it afforded rabbits 5020 and 5021, the survivors of the comparison test.

The antiserum used in the comparative tests on rabbits reported above has also been given an extensive field trial on natural cases of ictero-hemoglobinuria. The results have been very satisfactory, indicating a strictly specific reation.

A paper dealing with the preparation and use of this serum as a therapeutic agent is being prepared, and will be published shortly.

CONCLUSIONS

1. A new anaerobic bacillus, differing from other known pathogenic members of the genus Clostridium, is described. Cultural, biochemical, serologic, and pathogenic differences have been demonstrated.

2. The exact manner in which natural infection occurs in

cattle is not established, though the digestive tract is believed to be the sole portal of entry.

3. Koch's postulates relative to the etiology of an infectious disease have been fulfilled.

4. Thus, we submit the name *Clostridium hemolyticus bovis* for the anaerobic microorganism described in this paper.

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DISCUSSION

DR. B. T. SIMMS: I just want to congratulate the authors on the excellent work they have done in at last reaching a solution for this disease. This problem has been discussed before our Association for the last ten years. It was an easy thing to attack and then let alone. I have had just a small amount of experience in connection with it and I want to congratulate the authors for their efforts and in staying with the thing until results were accomplished.

DR. VAWTER: In this connection, I might state that along with this work we have prepared a specific serum, which has been used in the treatment of clinical cases for this disease for the past year and a half. We have been using this in the field and we did not include the preparation of the serum or the clinical use of the serum in our present paper, as that is to be published under a separate heading. However, it might be well to remark at this time that the

serum with which we have been working is prepared specifically for this disease and has been giving very good results in the field.

I might add that this serum gave us sixty-four per cent recoveries in 1923, the latter half of the year it was used, and in 1924 we had a recovery rate of seventy-five per cent with the use of this serum in clinical cases. However, it must be remembered that last year we had the greatest water deficiency upon the range that has been known to exist and the number of cases treated was considerably less last year than in previous years. At the present time we do not hesitate to go in and try to treat a case with serum that heretofore we would have regarded as totally hopeless. It used to be the case when an animal was passing hemoglobin in the urine we would look at it and walk off and let it alone, saying it was hopeless, but we do not particularly fear that kind of a case any more. If the case is passing bloody urine we do not bother about it, if the animal has a normal temperature and is standing up; we feel that the serum is giving us good results.

BUREAU TRANSFERS

Dr. Raleigh M. Ward (K. C. V. C. '12), from Chicago, Ill., to Indianapolis, Ind., on meat inspection.

Dr. Robert N. Ashley (K. C. V. C. '08), from Albuquerque, N. M., to Reno. Nev.

Dr. J. B. Schorfheide, from Peoria, Ill., to Madison, Wis., on meat inspection.

Dr. Clyde S. Hess, from Chicago, Ill., to South St. Paul, Minn., on meat inspection.

Dr. James T. Cullen (O. S. U. '10), from South St. Paul, Minn., to Fargo, N. D., in charge of meat inspection.

Dr. Howard D. Osborne (O. S. U. '21), from Austin, Minn., to Fargo, N. D., on meat inspection.

Dr. S. L. Ries (Iowa '12), from Ottumwa, Iowa, to Mason City, Iowa, on meat inspection.

Dr. H. W. Hall (Iowa '13), from Mason City, Iowa, to Ottumwa, Iowa, on meat inspection.

Dr. Joseph W. Huston (K. C. V. C. '18), from Lincoln Nebr., to Omaha, Nebr., on meat inspection.

Dr. Ival A. Merchant (Colo. '24), from Omaha, Nebr., to Lincoln, Nebr., on tuberculosis eradication.

OUTPUT OF BIOLOGICAL PRODUCTS FOR 1925

The quantity of anti-hog cholera serum produced by licensed establishments was 434,888,994 cubic centimeters, of which 299,446,329 cubic centimeters was ordinary serum and 135,442,665 cubic centimeters clarified serum. The quantity of simultaneous hog cholera virus produced was 33,153,654 cubic centimeters, while the production of hyperimmunizing virus amounted to 72,490,686 cubic centimeters and inoculating virus 274,985 cubic centimeters, making the total quantity of virus 105,919,325 cubic centimeters.

The production of other biological products by licensed establishments aggregated 23,860,776 doses, classified as follows: Bacterins, 6,245, 796; vaccines and viruses, 6,591,502; aggressins, 5,148,383; tuberculin, 3,112,458; avian tuberculin, 243,524; mallein, 45,164; antisera and sera, 2,473,949. (Report of Chief of Bureau of Animal Industry, 1925.)

ARMY VETERINARY SERVICE

CHANGES RELATIVE TO VETERINARY OFFICERS

Regular Army

Lewis E. Schweizer, Greenwich, Conn., accepted commission as 2nd Lieutenant in the Veterinary Corps, Regular Army, November 2, 1925, and was directed to report to the Commandant, Carlisle Barracks, Pennsylvania, for duty within 30 days of acceptance date.

Captain C. W. Greenlee relieved from duty at Fort Leavenworth, Kansas, effective about December 1, 1925, and directed to report to Commanding Officer, Fort Sam Houston, Texas, for duty.

Veterinary Reserve Officers

Additional Reserve Officers:

First Lieutenant:
Lebeson, Harry.....5 W. Larned Street, Detroit, Mich.

Second Lieutenants:
Brown, Harry Wilson.....415 E. 7th St., Portland, Oregon.
Gibbons, Walter Joseph.....203 Auburn St., Ithaca, N. Y.
Gibbons, Richard Vincent...203 Auburn St., Ithaca, N. Y.
O'Harra, Guy Lewis,.....3553 Caroline St., St. Louis, Mo.
Volgenau, Robert Herman...15 Orchard Place, Buffalo, N. Y.

Promotions

Meads, Frederick F., P. O. Box 477, Cherokee, Okla., promoted to grade of Captain.

Strickler, Don Baggerly, c/o Govt. Office, White Prov. Co., Howell Mill Road, Atlanta, Ga., promoted to grade of 1st Lieutenant.

Separations

Reinhardt, Robert Richard, 23 Water Street, Lincolnton, N. C., transferred to Cavalry Reserve.

COMMANDMENTS FOR HOG RAISERS

The Kansas State Agricultural College has laid down ten commandments for the best care of hogs:

1. Use a pure-bred boar.
2. Retain only good brood sows.
3. Raise two crops of pigs per year.
4. Provide green feed for summer.
5. Feed hay to sows in winter.
6. Prevent infestation by roundworms.
7. Use high protein supplements with corn.
8. Provide mineral matter.
9. Observe careful sanitation.
10. Cure meat for home use.

An eleventh commandment, that would not be inappropriate, might be added, as follows:

11. Learn to rely on your veterinarian to assist you in living up to commandments 6 and 9.

COMMUNICATIONS

ANENT MINERAL FOODS

To the Editor:

After reading the article by Dr. W. C. Nye, of Idaho, entitled, "A Timely Criticism," in the October issue of the Journal, prompts me to offer a few suggestions to aid in determining when minerals are lacking in the feeding of dairy cattle.

Undoubtedly many veterinarians are selling their clients commercial mineral compounds instead of determining what minerals are lacking, and to what extent. In fact this is another phase in the economical production of milk and butterfat.

Providing dairy cows with an amply supply of common salt daily, calcium and phosphorus are then the chief minerals with which we have to deal. Feeds that are high in calcium are alfalfa and clover. Feeds low in calcium are hominy, corn, oats, timothy hay and wheat straw. Feeds that are high in phosphorus are cottonseed meal and wheat bran. Medium in phosphorus are corn, oats and gluten feed.

Feeding a cow weighing 1000 pounds and producing 30 pounds of milk a day, the following roughage and grain will provide sufficient minerals:

Alfalfa	10 lbs.
Corn silage	35 lbs.
Grain mixture (as follows)	8 lbs.

Grain Mixture

Ground oats	400 lbs.
Corn meal	400 lbs.
Wheat bran	400 lbs.
Cottonseen meal	200 lbs.
Linseed meal	200 lbs.

The calcium content is 81 grams, and the phosphorus content is 42 grams. The requirements, according to Kellner, are calcium 69 grams and phosphorus 39 grams. There is an ample supply of both.

Now let us contrast this, in the feeding of a high producer—a cow weighing 1000 pounds and producing sixty pounds of milk a day:

Alfalfa	10 lbs.
Silage	35 lbs.
Grain mixture (same as above)	17 lbs.

The calcium content in this ration is 88 grams and of phosphorus 72 grams. The requirements are 104 grams of calcium,

and 70 grams of phosphorus—a deficiency of 16 grams of calcium and 2 grams of phosphorus.

The greatest deficiency of minerals exists when feeding roughages low in calcium. The chief source of calcium is in the alfalfa and clover hay. Cows, producing up to 30 or 40 pounds of milk a day, will receive an ample supply of these minerals in their ration when fed alfalfa or clover hay.

The high producers, however, do not receive the required amounts of these minerals in their rations, and should be supplemented with calcium and phosphorus in the form of steamed bone meal.

Just a word about vitamins, more particularly the fat-soluble, antirachitic vitamin D. This vitamin is present in the green leaves of alfalfa, clover and other grasses, and assists in the assimilation of calcium. This vitamin is readily destroyed by the sun's rays, therefore, in drying grasses they should not be exposed unnecessarily to the direct sunlight. As veterinarians, it behooves us to be informed with the new discoveries in animal nutrution.

In this letter I am largely quoting Professor C. F. Huffman, Research Assistant in Dairying at Michigan State College, from whom I have received the figures and rations.

E. C. JESPERSEN.

Milwaukee, Wis., Oct. 24, 1925.

BADLY PREPARED (?) VETERINARIANS

TO THE EDITOR:

Dr. N. S. Mayo did not comprehend the significance of the above words, used in his remarks discussing Dean Wegner's excellent paper read at the A. V. M. A. meeting, in Portland, Oregon. Law and the military regulations governed our admission, and established and defined our status, and it was then a case of "don't whine or grunt, but do your stunt."

The obituary of the late Dr. Benj. D. Pierce would not indicate that he was badly prepared when entering our Army, and later received the degree of D. V. S. (causa honoris) from McGill University, after it absorbed the Montreal Veterinary College. Dr. Schwarzkopf was similarly well equipped. He was in and out of our Army several times, dean of the McKillip Veterinary College for some time, even when Dr. L. A. Merillat was secretary of it. Dr. A. A. Holcombe left a very enviable record in the U. S. Army and the U. S. Bureau of Animal Industry. The

late M. J. Traecy, M. R. C. V. S., had been an officer in the British Army, and passed away while in our service in Cuba. Our Army appointees from Montreal, American, Columbia, Royal, Cornell, University of Pennsylvania, McGill, Ohio State University, United States College of Veterinary Surgeons, could not have been badly prepared; yet Waugh and Waugh, McDonald, Forbes, and Sidney Hunter might have come under that classification, as the Ontario Veterinary College was practically only a lecture course, at that time.

Files of the *American Veterinary Review* and of the *Journal of Comparative Medicine and Veterinary Archives* will indicate what they did at times. The JOURNAL of the American Veterinary Medical Association is circulated and well used all over the world, and our old army veterinary surgeons were equal to their confreres in civil life. Dr. Mayo should study Dickens, "during Lent," and get a working knowledge of our old British Isles adjectives. The late Maj. Gen. W. H. Carter once advised me to study Washington Irving, to get a smooth style of diction. Col. Griffin or Maj. John P. Turner could write a good-sized book about our old army veterinary service, somewhat similar to Houck's "History of the U. S. Bureau of Animal Industry."

JAMES A. WAUGH.

Pittsburgh, Pa., Dec. 16, 1925.

VETERINARY ADVERTISING

TO THE EDITOR:

Veterinary advertising has recently received considerable attention, not only in veterinary journals but at various association meetings. While little new can be added to this important subject, viewing it from a different angle may be helpful.

Veterinary advertising consists in presenting the advantages of veterinary services to the owner of live stock or pet animals as well as to the general public. To do this successfully the stock owner must be convinced that it is to his advantage to employ a veterinarian and that he will make money by so doing. This brings the subject right to the practicing veterinarian in his own community. He must give value received in veterinary service.

Prof. V. A. Moore has emphasized the fact that in any community the veterinary profession is judged very largely by the local practitioner who represents the profession to them. This responsibility is one that cannot be evaded. Every community,

and particularly a rural community, has certain established standards by which they judge professional men. The veterinarian must be a gentleman in the full sense of the word, in appearance as well as in action. The great poet has said, "Costly thy habit as thy purse can buy, but not expressed in fancy; rich not gaudy, for the apparel oft proclaims the man."

Another efficient method of advertising is to contribute short articles to local or live stock papers on subjects that are of interest to stock owners, particularly along the lines of live stock hygiene and sanitation. If there is an outbreak of hog cholera in the locality, a short article on swine hygiene and diet is always welcomed by the local paper.

Every veterinarian should be interested in the live stock industry and pet stock as well, and he should endeavor to stimulate an interest in and assist in building up the live stock industry in his locality. Farmers' institutes, live stock associations, local fairs and farm bureaus, boys' and girls' pig, calf and colt clubs, as well as poultry organizations, offer splendid chances to the veterinarian to help advance the interests of his community and to make himself and his profession known to all who may need his services.

It is the duty of a veterinarian to protect the live stock industry of his locality and also the public health, particularly in diseases transmissible from animals to man, and he can be of service in connection with the local milk and meat supply.

There is an inherent human tendency to "let George do it," but that does not work well in veterinary advertising, for George will get the publicity. The local veterinarian is his own best advertising medium.

N. S. Mayo.

Chicago, Ill., December, 15, 1925.

WHAT IS THE TROUBLE?

To the Editor:

There is not a veterinary practitioner, urban or rural, who will not testify to the fact that veterinary practice has been going through a change and still is changing from year to year.

The popularity of the automobile, auto truck and power machinery has grown to such dimensions that equine practice has become a minor source of income to any veterinarian. In the cities, the development of small animal practice has been a

source of revenue that has been the "life saver" of many veterinarians, when conducted in an establishment properly equipped. In the rural districts, the veterinarian has fallen back on or progressed to the treatment of swine, cattle, sheep and poultry.

Having had only one year's experience in a city, as an assistant to a practitioner in Indianapolis, in 1913, I will not give the situation of the city practitioner any further consideration. But, having practiced in a rural community for over ten years and being still so located, I feel that I do know something about the conditions surrounding rural practice and the problems the rural practitioner has to contend with.

When we attend assocation meetings and matters of quackery, or activities of county agents, farm advisers, peddlers, vocational agricultural instructors, farmer vaccinators, or veterinary instruction in our agricultural colleges come up for consideration, some one, who has not had any experience supporting a family upon the income derived from the practice of veterinary science in rural communities, will arise to give voice to an eloquent oration to the effect that virtue brings its own reward, and that we should improve our standing in our community, that we should do this and that, turn the other cheek, and various other musical advice. These men can talk so fluently and assume such airs and postures that we poor country hicks, when we get up and stammer and stutter, simply get red in the face and sit down, wishing that the floor would open and let us drop into the basement. The line of talk these men give us and the attitude they take are two things that keep a goodly number of rural practitioners from joining the state associations.

I am neither a kicker nor a pessimist, but am facing the situation with my eyes open to all the facts and my mind open to any feasible solution of the trouble. In order to convince some readers that I know whereof I speak, and that I am not "sour grapes," you will pardon a little personal history.

My wife and I came to this county-seat village of 3600 inhabitants, in the fall of 1913. In the spring of 1914, I was elected a deacon in the Presbyterian Church; in 1916, the superintendent of its Sunday School; in 1917, was elected a member of the village Board of Education, on which I have served for eight years, and on January 1, 1926, will enter upon my third four-year term. Have turned down the nomination for mayor twice within the last six years. Am a member and director of the local Kiwanis Club, also a member of the County Farm Bureau. Have men-

tioned these things simply to show that I *am not a misfit in the community.*

The past winter, personally, I have given a talk, operated the projector, and secured educational films for thirty-six meetings in our county, driving as far as twenty miles out to give a meeting. Have talked to Township Farm Bureau meetings whenever asked. This last August, personally planned for and made speeches at ten community getherings on ten successive nights, giving the stimulus that put four townships across on their petitions for area tuberculin testing. At present have under consideration, with the secretary of the Farm Bureau, the organizing of poultry clinics over all the county, in which all the local veterinarians will take part, in order to let people know that we are interested and capable of advising them on poultry problems.

Now I consider all these things worth while and if of any advertising value, perfectly legitimate, and I think everybody will agree with me. But so far, they have not solved the problem.

Our local situation is as follows: One farmer holds a State permit to treat his own hogs, and I must say that he honestly and honorably keeps the letter and spirit of the permit by tending strictly to his own hogs. But we have three others, without permits, who secure serum and virus from the Fidelity Supply Company, of 820 Exchange Avenue (Stock Yards), Chicago, said serum and virus being produced under government inspection and license. Also the federal government and the State Experiment Station furnish the above Fidelity Supply Company with cuts to illustrate their pamphlet, telling laymen how easy it is to treat their own hogs. In fact, a brother-in-law of Dr. H. H. Kettler secured serum, virus and syringes, at our suggestion, from this concern, without it making any inquiry to see whether he was a net wit or half-wit or perfectly rational. They simply shipped it as quick as they received the order. The syringes were Saxon and antiseptics and disinfectants were included in the shipment.

Another problem: Time after time men and women will say to me, "What do you find to do since there are not so many horses?" And they sure are surprised when I mention treating chickens or swine or sheep. Some even apologize for asking me to give them advice concerning stock other than horses and cows.

Three times within the last nine months a young veterinarian, a graduate of Cincinnati, who made a failure of practice at New Vienna, Ohio, has held public clinics within a block of my office,

under the auspices of a local retail drug firm, advertising the Lee Laboratories preparations for treating poultry. The same firm of druggists handles Avalon Farm Products and hires a man to peddle and canvass the farmers from house to house. The first two times they secured publicity through the newspaper; the last time through posters.

We have a hatchery located here. The manager culls the flocks from which he secures the eggs. The other day a farmer stepped up to me in the bank and asked me if this manager had shown me a certain chicken which had come from his farm, wanting to know if I had diagnosed the trouble. When informed that I had not seen it, but would be mighty glad to post one and find out what the trouble was, he remarked, "We have gotten it pretty well under control now." Another poultry expert!

What will be the outcome? Whither will it lead us? What is the remedy, if any? The answer is something elusive. It will require some intensive study. Personally, I think publicity. In my own case I have reached the dividing of the way. Whether I will be able to camp at the dividing point for a few months remains to be seen. Two courses are open: First, to do as I have been doing—being ethical in all things. Second, to advertise. Which shall it be? Am not ready to decide whether to retain my standing with my professional colleagues, with practice still dwindling, or to advertise by pamphlets, circulars and the press.

My opinion may be warped, and if it is, so also is that of many rural practitioners. We all feel that if the men who have the most influence in our state associations and state politics were facing the music as we are, there would be a different view expressed by them. We sure would enjoy the spectacle of some of our luminaries trying to get their bread, not to mention the butter, by the practice of veterinary medicine. It is an easy matter, when drawing a salary every month, to feel snug and satisfied, and pooh-pooh the other fellows' worries, to utter platitudes, and give voice to eloquent nothings. Possibly they do not realize that a $100.00 salary is equal to $250.00 of practice, that $2000.00 a year is more than the income or net profit of a $5000.00 practice, and that country practices running over that figure are less in numbers than those running under that figure.

We also feel that were quackery to spring up and make the inroads on small animal practice that it has on rural practice, there would sure be some holla made. You do not hear of prac-

titioners building hospitals for any other phase of practice except small animals. And I believe that a hospital and ambulance is certainly a big stroke of publicity and that rural practitioners will have to find something to equal them.

P. T. ENGARD.

Marysville, Ohio, December 15. 1925.

NEW JERSEY VETERINARIANS TO MEET WITH AGRICULTURISTS

An invitation is extended by the Veterinary Medical Association of New Jersey to the veterinarians of the metropolitan district, and likewise to those of Philadelphia and environs, to attend its forthcoming annual meeting and conference to be held under the auspices of Rutgers College and the State University of New Jersey at the College farm and experiment station, New Brunswick, N. J., on Tuesday and Wednesday, January 26-27, 1926.

Please mark your calendars and keep the date open, as this promises not only to be an interesting meeting from a professional point of view but also one highly important from the broader and more fundamental standpoint of animal husbandry and agriculture.

Arrangements for this meeting are in charge of a special committee, consisting of Drs. Wm. Herbert Lowe, Paterson, Chairman; J. H. McNeil, Trenton; E. L. Loblein, New Brunswick; and A. W. Smith, West Orange; together with F. G. Helyar, Director of Short Courses; Dr. Fred R. Beaudette, poultry pathologist; and J. W. Bartlett, professor of dairy husbandry, representing the College of Agriculture.

MOTION PICTURES STIMULATE TICK ERADICATION

The use of motion pictures as a means of showing proper methods of conducting tick eradication and the benefits to be derived, and as an agent in molding favorable sentiment for this work, was continued with gratifying results with two portable motion-picture outfits. With these machines, exhibitions were given in small towns and rural school houses in the tick-infested districts of Arkansas, Alabama, Florida, North Carolina, South Carolina and Texas. There were 530 exhibitions given to audiences aggregating 87,000 persons. (Report of Chief of Bureau of Animal Industry, 1925).

AMERICAN VETERINARY MEDICAL ASSOCIATION

Minutes of Meeting of Executive Board, Chicago, Ill., December 1, 1925

A meeting of the Executive Board was held at the LaSalle Hotel, Chicago, Ill., Tuesday, December 1, 1925, at 2 p. m.

Present: Drs. David S. White, T. E. Munce, C. H. Stange and B. W. Conrad, members of the Board; President Adams, Treasurer Jacob, and Secretary-Editor Hoskins.

In the absence of Dr. Way, Dr. B. W. Conrad was chosen to act as chairman of the meeting.

The Secretary brought to the attention of the Board the fact that there was no provision for certificates, of any kind, for honorary members of the Association, and requested the Board to consider the desirability or otherwise of having some form of certificate for men elected to honorary membership. At the present time, a letter of notification from the Secretary is the only documentary evidence of such membership. The Secretary was directed to get estimates of the cost of having a suitable plate engraved and certificates prepared.

The Secretary reported to the Board that he had received communications from a number of the section officers, who were very desirous of having the Association make provision for their expenses, incurred in attending annual meetings and at least one other meeting during the year, called for the purpose of going over plans for the program. Several members of the Board expressed the opinion that such a plan would be very desirable, but that the present financial condition of the Association would hardly warrant an appropriation large enough to take care of such expenses for eight section officers, located in widely separated parts of the country.

A communication relative to the memorial for Dr. Schmidt, from Dr. H. Jensen, of Kansas City, Mo., was reported by the Secretary, who asked for instructions from the Board. It was called to the attention of the Board that the Association now has a committee with this particular project in hand, that this Committee had rendered a report at Portland and that same was accepted by the Association. The Board, having no authority to alter the recommendations of the Committee, approved by the Association, were of the opinion that the only thing to do was to

allow the Committee to proceed with the plans which had already been started by the Committee on the Schmidt Memorial.

Chairman Way arrived, accompanied by Dr. W. W. Dimock, of Lexington, Ky., chairman of the Local Committee on Arrangements for the 1926 meeting.

Dr. Dimock was asked to advise the Board as to the wishes of the Kentucky veterinarians regarding dates for the Lexington meeting. Dr. Dimock reported that the desirable dates had been narrowed down to two and these were presented to the Board for a selection. Dr. Way moved that the meeting be held August 17, 18, 19 and 20, 1926. The motion was seconded by Dr. Stange and unanimously carried. A very thorough discussion of plans for the program followed, particularly with regard to the clinics, section meetings, and the proposed trip to the breeding farms around Lexington. Dr. Munce moved that the details of the program, including the clinics, be left in the hands of the Secretary and the chairman of the Local Committee on Arrangements. The motion was seconded by Dr. Conrad and unanimously carried.

The Secretary called the attention of the Board to the action of the Section on Small Animal Practice in appointing an assistant secretary for the section. It was the opinion of the Board that such an appointment was illegal and that the appointment should not be recognized. It was pointed out that there was a legal way for securing the appointment of section officers, whenever necessary, established by precedent and, if the Section on Small Animal Practice needed an additional officer, the matter should be presented to the Association in the proper way.

The question as to whether the Association should publish a membership directory during the coming year was presented by the Secretary. After a very thorough discussion, Dr. White moved that the Secretary be authorized to proceed with the publication of a new membership directory, as soon after the first of the year as possible. The motion was seconded by Dr. Stange and unanimously carried.

The deferred application of Dr. Victor J. Brauner was again brought before the Board for consideration. The Secretary reported the further investigations made by and letters received from Drs. N. F. Williams and R. P. Marsteller. After a very thorough review of the facts in the case, Dr. Conrad moved that the objections to Dr. Brauner becoming a member be not sus-

tained and the applicant be admitted to membership. The motion was seconded by Dr. Stange and unanimously carried.

The Secretary reported that objections had been filed against Dr. Alfred Hendriksen, of Burlington, Wash., who was an applicant for membership. The Secretary was instructed to secure further evidence to substantiate the charges which had been preferred against the applicant.

The Secretary reported that the official automobile emblem of the A. V. M. A. had been objected to by a county medical society of Arkansas, as being an infringement upon the design adopted by the medical profession. Attention was also directed to an item which appeared in the *Bulletin* of the American Medical Association bearing on this point. No action was taken.

Several instances of violations of the code of ethics by members of the A. V. M. A. were reported by the Secretary, supported by documentary evidence. Each case was considered separately and the Secretary was instructed to communicate with each member, notify each one that charges had been preferred against him, and give each member an opportunity to defend his actions.

The Secretary reported that there seemed to be some misunderstanding as to the exact nature of the medal to be awarded the army veterinary officer passing the highest examination in the Army Medical School. The opinion was expressed that it was the intention of the Association to defray the expense of the annual awarding of the present medal of the Army Veterinary Corps to the member of the Corps passing the highest examination in the Army Medical School, and that it was not the intention of the resolution adopted at Portland to provide a new medal, the amount of $27.00 provided being entirely inadequate for such a purpose.

Dr. Way announced the appointment of an Executive Board committee, to study the proposal that the American Veterinary Medical Association publish a journal for laymen, along the lines of *Hygeia*, published by the American Medical Association. On the Committee Dr. Way appointed Dr. C. H. Stange, chairman, Dr. David S. White, Dr. D. H. Udall, Dr. N. S. Mayo and Secretary Hoskins. This Committee had not yet had an opportunity to hold a meeting and, therefore, was not ready to report to the Board.

The Secretary reported that the booklets already published had apparently been favorably received by a great many members of the Association, particularly the one entitled "Nothing

to Sell but His Services." The plan of distribution adopted was approved and the Secretary was instructed to proceed with the publication of other booklets, from time to time.

The plans of the Policy Committee for the conference, to be held that evening, with veterinarians representing the various agricultural colleges throughout the country, were approved by the Board.

The meeting adjourned at 7:00 p. m. to be re-convened at the call of the Chairman.

H. PRESTON HOSKINS, *Secretary.*

MINERAL NUTRIENT REQUIREMENTS OF FARM ANIMALS

In view of the prominence which has recently been given the above subject in veterinary circles, a prominence which the importance of the whole question demands, we consider it timely to quote a few paragraphs on the subject, by Dr. E. B. Forbes, taken from the most recent report of the Pennsylvania State College. Dr. Forbes is chairman of the Sub-Committee on Animal Nutrition of the National Research Council, and is one of America's leading authorities on such questions.

"On account of the undiscriminating commercial exploitation of the mineral nutrient requirements of farm animals, which is resulting in an extensive, unwarrantable tax upon agricultural industry, a discussion has been issued of the principles of the need for such nutrients.

"It is shown that while farm animals stand in constant need of mineral nutrients, these are so commonly supplied by their normal rations that the inclusion of mineral components in the mixed feeds for general purposes is not warranted, and that the feeding of mineral supplements is advisable only under certain unusual conditions of feeding and production, in which the supply of mineral nutrients is uncommonly deficient, or in which the demand for mineral nutrients is unusually extensive.

"When mineral supplements other than common salt are needed the requirement is usually for calcium, phosphorus or iodin. There is no warrant for complicated mixtures.

"In relation to general farm management the facts as to mineral metabolism are such as to emphasize the importance of growing the calcium-rich leguminous roughages, and the handling of breeding females in such a manner as to provide an adequate resting period before parturition, with feeds rich in mineral nutrients, which, as already suggested, signifies leguminous roughage."

Hogs fed salt, at the Iowa Agricultural Experiment Station, reached 300 pounds in from sixty to seventy-two days less time than hogs left to get along without it.

More than two million American farmers belong to more than twelve thousand cooperative organizations, doing a business of more than two and a half billion dollars a year.

ASSOCIATION MEETINGS

VETERINARY MEDICAL ASSOCIATION OF NEW YORK CITY

The regular monthly meeting of the Veterinary Medical Association of New York City was called to order by the president, Dr. Bruce Blair, in the Academy of Medicine, 17 W. 43rd St., New York City, October 7, 1925, at 8:30 p. m.

The minutes of the June meeting were read and approved.

Dr. Adolph Eichhorn, of Pearl River, N. Y., was the speaker of the evening. He first spoke of the A. V. M. A. meeting at Portland, Ore. During his remarks he referred to the increase in small animal clinics held, and the greater increase in small animal practice throughout the country. This was much in evidence at the meeting. The absence of veterinarians from the East was very noticeable, but a very large delegation from the West and Middle West was present. The meeting proved to be quite successful from every standpoint. Dr. Otto Faust, of Poughkeepsie, N. Y., was elected a vice-president.

Dr. Eichhorn spoke at length on the veterinary situation in the West. He stated that, in the past, many practitioners in the western states confined their practice largely to giving hog cholera serum and virus, and in some instances made the work as simple and unprofessional as they could, at the same time charging as much as possible, as they had a limited field and time to work. Now, since various states make it lawful for the farmers to use serum, the veterinarian seems to have lost his hold, and other fields—dairy and food inspection—have not been developed. This naturally will take time, and the practitioner will have to work hard to try to develop these fields.

Dr. Otto Faust spoke of the high spots of the A. V. M. A. meeting.

Dr. A. W. Smith, of West Orange, N. J., spoke of the splendid meeting held at Asbury Park, in July. A number of interesting papers were read, some by New York veterinarians. Dr. Robt. S. MacKellar gave a very interesting report of the New York State Society meeting, held at Ithaca. Dr. MacKellar was elected vice-president for the 1926 meeting.

The subject of rabies and the results following vaccination were discussed by many members. Dr. Eichhorn explained many points not quite clear on this subject.

A vote of thanks was extended Dr. Eichhorn for his interesting contribution to the program.

Drs. Robert Miller, C. P. Zepp, C. Ross and Gordon were elected to membership.

No further business appearing, the meeting adjourned.

November Meeting

The regular monthly meeting of the Veterinary Medical Association of New York City was held in the Academy of Medicine, 17 W. 43rd St., New York City, November 4, 1925, Dr. Bruce Blair presiding.

The minutes of the October meeting were read and approved.

Dr. Robert S. MacKellar presented for examination a toy poodle. This dog would apparently be feeling fine, when suddenly it would raise its hind legs high up in the air and walk around on its front feet. It was the opinion that the dog was suffering from some disturbance of the central nervous system.

Dr. Maurice C. Hall, chief of the Zoological Division, Department of Agriculture, Washington, D. C., was the speaker of the evening. His subject, "Anthelmintic Treatment," was most thoroughly covered. He cited many experiments during his years of experience with the federal department and other institutions.

His address was followed by a question box. A large number of questions were asked, and these were certainly most satsifactorily answered by Dr. Hall. The Association was indeed fortunate in being able to have Dr. Hall present and to speak on such an important subject.

A rising vote of thanks was extended Dr. Hall for his interesting and instructive talk.

Dr. C. S. Chase reported an unusual case of what was thought to be *Filaria oculi*, but after operation it proved to be a thorn in the eye.

Dr. Jacob Lebish was elected to membership.

No further business appearing, the meeting adjourned.

C. G. Rohrer, *Secretary*.

BAY COUNTIES VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Bay Counties Veterinary Medical Association was held November 11, 1925, in the banquet room of the States Restaurant, San Francisco, Calif.

At 7:30 o'clock, thirty-three members and visitors sat down to a delicious beef steak dinner, and about 8:30 President Clemens called the meeting to order.

The minutes of the October meeting were read and approved. The annual reports of the Secretary-treasurer were read and approved and ordered filed.

The President announced that nominations for officers for 1926 were still open and Dr. O. A. Longley withdrew his candidacy for president and nominated Dr. Geo. H. Hart, in his stead. Dr. J. M. Arburua asked that a long-established precedent be lived up to and that the Vice-president be promoted to the presidency, provided that he is still in good standing. Dr. H. E. Torgersen withdrew his candidacy for vice-president and nominated Dr. O. A. Longley to that office. Motion was made and seconded that nominations be closed and that the Secretary cast the ballot for the three officers. The Secretary reported that a unanimous vote was cast for the following: Dr. G. H. Hart, president; Dr. O. A. Longley, vice-president; Dr. Cliff D. Carpenter, secretary-treasurer.

The Secretary read a letter from Colonel Munson, at the request of Dr. H. E. Torgersen. Following the reading of the letter Dr. C. M. Haring moved that a copy of Colonel Munson's letter be sent to the veterinarians in the Bay Counties Association, and that Colonel Munson and Colonel Fraser be invited to the December meeting and asked to talk on the Veterinary Reserve Corps.

Program

Dr. Dudley Smith, president of the League for the Conservation of Public Health, spoke at length on the ideals and functions of the League and reviewed the present status of anti-medical propaganda. He suggested that a committee of five Bay Counties members be appointed, who could act in many capacities, such as pointing out inefficiencies of present health laws and suggest new provisions, and to write articles on the invasion of the veterinary professions. He further suggested that we become associate members of the League and subscribe to "Better Health." Dr. Hart suggested that this was a State matter and instructed the Secretary to refer this matter to the State Association at its adjourned meeting at Sacramento, in January.

President Clemens next introduced Mr. John F. Kennedy, secretary of the Regional Plan Association, San Francisco Bay

counties, and next Mr. Fred Dohrmann, president of the same Association, who gave the members a clearer vision of the possibilities for developing the district immediately surrounding San Francisco Bay. Mr. Dohrmann showed that permanent play grounds, bridging the Bay, sewage disposal and the ever-increasing traffic problem were the four major considerations in any development scheme affecting the Bay district.

President Clemens thanked the speakers of the evening for their time and efforts. He then thanked every member of the Bay Counties for their loyal support during his term of office and proceeded with the installation. After the newly elected president was in the chair, retiring President Clemens turned the meeting over to him and he installed the Vice-president and Secretary-treasurer.

Adjournment took place at a late hour.

CLIFF D. CARPENTER, *Secretary.*

ILLINOIS STATE VETERINARY MEDICAL ASSOCIATION

The forty-third annual meeting of the Illinois State Veterinary Medical Association was convened at the Lexington Hotel, Chicago, Ill., December 1, 1925. It was a one-day meeting of three sessions: morning, afternoon and evening. The meeting was adjourned in order that the members could attend the entire program of the U. S. Live Stock Sanitary Association, December 2-3-4. The attendance was about 250, including members and visitors.

Dr. W. J. Embree, chief veterinarian of the Western Weighing and Inspection Bureau, entertained the Association with a number of moving pictures, while the audience was gathering and throughout the meeting. In lieu of the usual presidential allocution, President Quitman delivered an address analytic of the veterinary situation in the State, and Secretary Merillat read his annual report, in which he announced his retirement from that office. Abstracts from the report were ordered printed for distribution to all of the members, in view of reviving interest among delinquents.

The program, a somewhat new departure in that connection, was an all-Illinois contribution, comprising a lecture and questionnaire on each branch of veterinary practice: horse, cattle, swine, poultry, and small animals.

Under this plan of conducting the didactic feature of a veterinary convention, each lecturer is charged with the duty of bringing before the meeting all questions of current interest in the branch assigned to him, and is expected to feature queries and discussions from the audience as much as possible. The underlying idea is to cover well-selected ground and to get out the best information on each topic the audience is capable of exposing, in contradistinction to the question box or round-table systems which often consume valuable hours of a convention in the discussion of minor topics.

The Didactic Program

1. "Lecture and Questionnaire on Horse Practice," by Dr. W. H. Welch, Lexington. Among the subjects brought out by Dr. Welch were: Postmortem lesions in death from electric shock, hypersensitiveness of the neck of work horses, the treatment of "bull-heavers," the cause and treatment of tongue-lolling, and many others. Contrary to expectations, the horse section excited so much interest that additional time was voted to Dr. Welch to complete the presentation of his program.

2. "Lecture and Questionnaire on Small Animal Practice," by Dr. Fred R. Whipple, Peoria. This covered a wide territory, including cecitis, parasitic worms, canine distemper, deficiency diseases, the dosage of arecolin, the action of castor oil, etc.

3. "Lecture and Questionnaire on Swine Practice," by Drs. R. E. Kluck, Forreston, and J. S. Koen, Bloomington. These men extended over this field in splendid detail and excited animated discussions in which Drs. A. T. Kinsley and E. K. Glover, of Kansas City, and E. R. Steel, of Grundy Center, Iowa, participated.

4. "Lecture and Questionnaire on Bovine Practice," by Dr. Harry Caldwell, Wheaton, brought out lengthy discussions on bovine tuberculosis eradication, breeding problems, digestive disorders, mastitis, metritis, retained placenta and others. Nothing of momentary interest seems to have been omitted in this section, and here too the members voted additional time for Dr. Caldwell to complete his subject.

5. "Lecture and Questionnaire on Poultry Practice," by Dr. Robert Graham, professor of Animal Pathology, University of Illinois. This covered briefly the work under way at the University in stimulating the interest of the veterinarians of the State in the problems of the vast poultry interests. Dr. Graham ad-

vised veterinarians to continue their studies of poultry diseases, and gave out a wealth of exceedingly practical information on the differential diagnosis of the more common fowl ailments. Assisted by Chief Veterinarian, Dr. F. A. Laird, Springfield, Drs. E. E. Robinson, Mazon, and J. R. Christian, Woodhull, the questions of bacillary white diarrhea, coccidiosis of chicks, fowl typhoid and fowl cholera, roup, parasites and other conditions were vividly discussed.

6. "Lecture and Questionnaire on Professional Questions," by the Secretary, contained discussions of the various agencies which tend to discredit veterinary practice, and touched upon the deep-rooted habit of agricultural interests of this country teaching everyone to treat his own live stock, instead of concentrating upon developing higher ideals in independent veterinary education. In a spirited address, Dr. J. S. Koen drew attention to the magnitude of outside interference with veterinary practice by certain farm advisors who advertised freely in local papers to the effect that veterinarians are not needed where their service is available. The program was concluded by the appointment of a committee instructed to take steps to develop a better understanding between the veterinarians of the State and the authorities who have their destiny in hand.

The following officers were elected: Dr. R. E. Kluck, of Forreston, president; Dr. C. C. Hastings, of Williamsville, vice-president; Dr. W. H. Welch, of Lexington, secretary-treasurer; Drs. W. B. Lane, Aurora; H. G. Hoover, Sterling; F. R. Whipple, Peoria; J. G. Blum, Normal; A. E. Dickerson, Springfield; A. E. Etchison, Assumption; C. B. Michaels, Collinsville, members of the Executive Board.

Under the new organization of this Association, the State is apportioned into seven districts, each of which is represented on the Executive Board by a member elected by the local association having jurisdiction over the territory prescribed in the constitution for each district.

L. A. MERILLAT, *Secretary.*

HORSE ASSOCIATION OF AMERICA

The Horse Association of America, now coming into full strength as a seven-year-old, held its seventh annual meeting at the Blackstone Hotel, Chicago, Ill., December 2, 1925.

The business meeting disclosed that the Association was in a strong, vigorous condition, financially and otherwise; that the

thorough investigations made into every phase of the horse and mule industry had won an enviable reputation for the Association; and that its growth and influence was proceeding rapidly and steadily.

More than a quarter of a million people attended the seventy-eight pulling contests in five states, in which the horse power of horses and mules was measured with the dynamometer. Men who were in actual charge of these tests in Colorado, Iowa, Wisconsin, Michigan and Pennsylvania were present and reported on results. They declared that the contests were a great drawing-card for fairs, farmers' picnics, etc., and that they were of distinct educational value, teaching the value of training, proper harnessing and driving, and that they were developing facts about the type and temperament of horses and mules best suited to heavy draft work. Ten other states are already making arrangements for the purchase of dynamometers for use in their own states.

Mr. Harry N. Taylor, president of the United States Distributing Corporation and the United States Trucking Co., New York City, using over 1200 horses in the trucking business in and around New York City, says the horse has proved himself the most economical transportation unit. "To give our customers the best service, we must have sound, well-muscled, thick-middled horses, weighing in hard working flesh from 1550 to 1700 pounds. There is a shortage of such horses now. Farmers who will raise them can sell them at a good price."

Professor C. F. Curtiss, Iowa State College, said: "If horses ever should become so scarce as to be supplanted to any considerable extent by machinery, it will mean that many farms which cannot be worked profitably by machinery, because of size, weather or soil conditions, will be abandoned. That will create a food shortage that will endanger the health of the nation as a whole. One of the most effective ways to insure efficient breeding of the right kind of horses is to establish government subsidy of stallions."

Dr. John W. Adams, president of the American Veterinary Medical Association, gave a very interesting address in which he touched on ways of increasing horse efficiency.

The following members were elected as directors of the Association for the regular three-year term of office: H. A. Bascom, Boston, Mass.; George S. Bridge, Chicago, Ill.; W. S. Dunham, Wayne, Ill.; E. A. Hendrickson, Indianapolis, Ind.; and R. P. Carr, Buffalo, N. Y. Thomas E. White, St. Mary's Wheel and

Spoke Co., was elected to fill the unexpired term of Henry G. Herget.

At a meeting of the Board of Directors of the Horse Association of America, Wirth S. Dunham, Wayne, Ill., was elected president; R. Lawrence Smith, New York City, first vice-president; F. H. Sweet, Kansas City, Mo., second vice-president; William Brezette, Indianapolis, Ind., treasurer; Wayne Dinsmore, Chicago, Ill., secretary, and William R. Murphy, Philadelphia, Pa., assistant secretary.

WAYNE DINSMORE, *Secretary.*

CONESTOGA VETERINARY CLUB

The regular monthly meeting of the Conestoga Veterinary Club was held at the hospital of Dr. Harry W. Barnard, Lancaster, Pa., December 10, 1925.

Dr. W. J. Lentz, professor of anatomy and in charge of the small animal clinic in the University of Pennsylvania Veterinary School, addressed the meeting on "Diseases of Small Animals." This lecture was the fourth of the present series being given by the University of Pennsylvania Veterinary Extension School. In addition, a clinic was held, and a number of interesting operations performed by Dr. Lentz.

Dr. Harry W. Barnard presided at the meeting.

HENRY S. WEBER, *Secretary.*

WESTERN NEW YORK VETERINARY MEDICAL ASSOCIATION

The twelfth annual meeting of the Western New York Veterinary Medical Association was held December 10, 1925, at Buffalo, N. Y.

The meeting opened with a clinic at the hospital of the Erie County Humane Society and consisted of cases for operation and diagnosis. Several cases were operated on during the afternoon and a number of cases were presented for observation and diagnosis.

The clinic was followed by a business meeting. The election of officers for the coming year resulted as follows: Dr. Geo. R. Chase, Batavia, N. Y., president; Dr. H. D. Martin, Buffalo, N. Y., vice-president; Dr. F. F. Fehr, Buffalo, N. Y., secretary-treasurer (re-elected). Dr. J. V. Hills, of Gowanda, was elected as director to fill the place of Dr. H. D. Martin, whose term

expired. Dr. E. L. Volgenau, of Buffalo, was re-elected for another three-year term, as director.

At 6:30, the members were joined by their wives, who had been entertained during the afternoon at the home of Mrs. H. D. Martin, and proceeded to the Cafe Palais Royal, where dinner was served, after which the ladies were escorted to the theatre and the members of the Association reconvened at the S. P. C. A. Hall for a literary program.

A paper entitled, "The Nervous Form of Canine Distemper" was ably given by Dr. R. H. Volgenau. Dr. John Sturrock, of Attica, gave a paper on "Azoturia," which was highly interesting and instructive. Both of these subjects were well discussed by all the veterinarians present.

F. F. FEHR, *Secretary.*

CENTRAL NEW YORK VETERINARY MEDICAL ASSOCIATION

The sixteenth semi-annual meeting of the Central New York Veterinary Medical Association was held in Syracuse, N. Y., Nov. 12, 1925.

The meeting opened with a clinic at the infirmary of Dr. J. A. Pendergast. The following cases being operated on:

Bay mare, Dr. Burk's case.
Extracting two molars.
Surgeons: Drs. Long and Stack.
White poodle, Dr. J. A. Pendergast's case.
Cleaning and extracting teeth.
Surgeon: Dr. J. A. Pendergast.
Black spaniel, Dr. J. A. Pendergast's case.
Bronchitis, treated by Dr. Pendergast.
Black spaniel, Dr. J. A. Pendergast's case.
Spayed. Surgeon: Dr. W. L. Baker.
Black mule, Dr. J. A. Pendergast's case.
Ring-bones on both front feet.
Neurotomy was performed, the plantar operation being performed on one, and the median on the other.
Surgeons: Drs. Long and Stack.

This closed a very interesting clinic and an adjournment was taken to the Yates Hotel for the regular business session and literary program. The meeting was called to order at 3:30 p. m., with the President, Dr. W. M. Long, in the chair.

The minutes of the previous meeting were read and approved and ordered placed on file.

Roll-call showed eighteen members and visitors present. The latter included Dr. D. H. Udall, of Cornell University, and

Dr. J. G. Wills, state veterinarian. Drs. H. K. Leonard, of Mexico, N. Y., and A. K. Zellner, of Oneida, N. Y., were elected to membership.

Dr. W. G. Hollingworth gave a talk on "The Duty of the Veterinarian to the Public Health." He emphasized his talk by exhibiting placards of inscriptions and quotations.

Dr. J. H. Stack gave a report of two cases of mastitis which he had treated with intravenous injections of flavines, the same being put out by R. J. Strasenburg Co., under the name of "acridine compound." This was very interesting and was followed by a like report by Dr. Long. An interesting discussion followed.

Dr. A. E. Merry gave a very interesting verbal report of several cases he had met with in his practice with small animals: (1) rupture of the diaphragm; (2) a case where the mother and three puppies died of intussusception of the bowel; (3) spaying of a cat that had but one ovary; (4) a severe case of prolapsus of the bowel in a dog. These cases were very interesting and called forth a good discussion.

Dr. J. B. Knapp gave a very interesting report of a case of retention of the placenta, which was followed by a second calf—dead—and this followed by milk fever, the cow finally making a good recovery. This was a very extraordinary case, as it seldom occurs that milk fever follows such a case of parturition.

Dr. J. N. Frost, being on hand to give the after-dinner talk that he had promised, was asked to give it at this time, and gave us a very interesting account of his trip to the American Veterinary Medical Association meeting in Portland. This was very much appreciated.

At this time an adjournment was taken, and closed a very interesting and profitable meeting.

W. B. SWITZER, *Secretary.*

WILLAMETTE VALLEY VETERINARY ASSOCIATION

The Willamette Valley Veterinary Association was formed at Salem, Oregon, December 2, 1925, with a membership of about twenty. It is expected that the membership will be increased to fifty, as there are that many eligible veterinarians in the territory served by the new association.

Officers were elected as follows: President, Dr. G. F. Korinek, Stayton; vice-president, Dr. R. J. Nichols, McMinnville; secretary, Dr. Fred W. Lange, Salem.

NECROLOGY

WENDELL R. SMITH

Dr. Wendell R. Smith, Director of the Bureau of Animal Industry, of the Department of Agriculture of Idaho, died suddenly at his home in Boise, November 29, 1925. Death was due to angina pectoris, following an attack of acute indigestion of 15 minutes duration. Dr. Smith died before medical attendance reached him.

Born in Norwich, Ohio, March 16, 1882, Dr. Smith made his home for some time in Cleveland, Ohio, and later in Washington, D. C., where he attended and was graduated from the United States College of Veterinary Surgeons in 1920. He went to Idaho the same year and engaged in private practice in Boise. In 1923 he was appointed Director of the Bureau of Animal Industry, of the State Department of Agriculture.

Dr. Smith joined the A. V. M. A. at the Portland meeting in 1925. He was also a member of the Idaho State Veterinary Medical Association. When the Western States Live Stock Sanitary Association was organized, in 1924, Dr. Smith was elected secretary of that body and was re-elected to the same position at the 1925 meeting, held in Portland, Oregon. He was a member of the Norwich, Ohio, Lodge of Elks and the Boise Council of the Knights of Columbus.

Quoting Governor C. C. Moore: "Idaho has lost a man whose value would be almost impossible to overstate. He was a rarely efficient organizer, not only in his Bureau and Department but throughout the State and his counsel and judgment were evidently regarded most highly throughout the West. He was an untiring worker. His loyalty was remarkable—it was unlimited and without reserve. And as to the work in which he was engaged with his associates—eradicating disease and improving standards of live stock—if he had lived to complete it, this would have placed Idaho beyond all the states of the Union." Commissioner A. W. B. Kjosness, of the State Department of Agriculture, spoke in the same glowing terms of Dr. Smith's services. He said: "I gave him the unswerving confidence he earned and deserved. He was a public official of the highest type and duty was always his first and last regard."

Dr. Smith is survived by his widow and one daughter.

HERBERT SILVERWOOD

Dr. Herbert Silverwood, of Portland, Oregon, died at his home, November 16, 1925. Death was due to a complication of diseases, ending in broncho-pneumonia. He was born January 23, 1868, in Shelly, England. He was graduated from the Chicago Veterinary College in the year 1907. Soon after graduation he entered the federal service, and was sent to Pendleton, Oregon, on field work. After two years with the government he entered private practice and was located at Ontario, Oregon. In the year 1910 he was appointed inspector in the Dairy Division, Bureau of Health, Portland. His duties included the testing of all dairy cows supplying milk to the city of Portland. He was in the employ of the city at the time of his death.

About two or three months prior to his death, in the performance of his duties, he became entangled in a cow-chain and was painfully hurt, the animal throwing him and hurting his side and back. He soon began to fail, but was confined to his bed only five weeks.

Dr. Silverwood probably tested more cows than any other man in the Pacific Northwest. He was considered one of the very best men in that work. He was careful and conscientious in all his work. He was held in the highest esteem by all the dairymen.

Dr. Silverwood joined the A. V. M. A. in 1907. He was a member of the A. F. & A. M., Albany, Oregon. He was a member of Trinity Episcopal Church and a member of the choir. The funeral was conducted from his church, with Masonic services at the grave. He was laid to rest in Riverview cemetery. He was highly respected by all who knew him, and had a host of friends. He leaves a widow, Sarah E. Silverwood, and two brothers and two sisters in England

E. E. C.

J. J. RECTENWALD

Dr. J. J. Rectenwald, of Pittsburgh, Pa., died November 23, 1925. He was a graduate of the University of Pennsylvania in both veterinary (1894) and human medicine (1895). He never practiced veterinary medicine but was prominently identified with the medical profession in the Smoky City. Dr. Rectenwald was instrumental in the movement which secured a sum of money sufficient to build the proposed new South Hills General Hospital.

He was president of the Board of Directors of that institution. The deceased was a son of Dr. N. Rectenwald, for many years city veterinarian of Pittsburgh.

MILTON E. CONARD

Dr. Milton E. Conard, of West Grove, Pa., died at his home, November 20, 1925. Death followed a brief illness caused by uremic poisoning. He was 74 years of age.

Dr. Conard was a graduate of the University of Pennsylvania, class of 1891, and for a number of year, up until 1913, he was lecturer on Veterinary Obstetrics and Milk Hygiene in the Veterinary School. For a number of years he was veterinary inspector for the Abbott Alderney Dairies, of Philadelphia.

He is survived by two daughters.

C. J. HUENINK

Dr. C. J. Huenink, of Cedar Grove, Wis., died at his home, October 28, 1925. A native of Holland, he came to this country as a child, was raised in the vicinity of Cedar Grove, attended and was graduated from the Chicago Veterinary College in 1888, and practiced in his home community for about twenty-five years, when he retired. Dr. Heunink was intimately associated with the business, civic and social activities of his town. He is survived by his widow, twelve children, three brothers and a sister.

DAVID S. JAFFRAY

Dr. David S. Jaffray, of Chicago, Ill., died at the home of his daughter, in Oak Park, Ill., November 21, 1925, at the age of 76 years. He had been a resident of Chicago since 1865. He is survived by two daughters and three sons, including Drs. David S., Jr. and John B. Jaffray, Chicago veterinarians.

MRS. JOSEPH PATT

We deeply regretted to learn of the sad death of Mrs. Joseph Patt, wife of Dr. Joseph Patt (K. C. V. C. '93), of Mobile, Alabama, while in Europe last summer. Mrs. Patt was apparently in the best of health, when she was taken ill, at Cöln am Rhein, Germany, and died fifteen minutes later. Our heartfelt sympathy goes out to Dr. Patt.

MARRIAGES

Dr. W. J. McIntosh, of Mill Shoals, Ill., to Miss Imogene Attebury, of Mill Shoals, Ill., November 5, 1925.

Dr. James E. Shirley (Ont. '24), of Kittanning, Pa., to Miss Florence Magdalene Sober, of Leechburg, Pa., November 26, 1925, at Leechburg, Pa.

Dr. Harvey L. Fell (U. P. '25), of Wilmington, Del., to Miss Harriet Talley, November 28, 1925.

Dr. Oliver F. Campbell (Ind. '02), of Flora, Ind., to Mrs. Mary Miller, of Flora, Ind., December 2, 1925, at Delphi, Ind.

ENGAGEMENT

Mr. and Mrs. Charles T. Burgess, of Newtown Square, Pa., have announced the engagement of their daughter, Miss Ethel Milfred Burgess, to Dr. Thomas J. Gasser (U. P. '24), of Berwyn, Pa.

BIRTHS

To Dr. and Mrs. C. O. Benson, of Ogdensburg, N. Y., a son, Kenneth Albion, October 29, 1925.

To Dr. and Mrs. F. S. Sharp, of Ute, Iowa, a daughter, Mariana, October 30, 1925.

To Dr. and Mrs. J. J. Ryan, of Palmer, Iowa, a son, Eugene Leo, October 30, 1925.

To Dr. and Mrs. A. P. Sturrock, of Waterford, Pa., a son, Eldon Vere, November 2, 1925.

To Dr. and Mrs. M. J. Hughes, of Long Island City, N. Y., a daughter, Virginia May, November 15, 1925.

To Dr. and Mrs. M. G. Fincher, of Ithaca, N. Y., a daughter, Joyce Elma, November 25, 1925.

To Dr. and Mrs. W. A. Sullivan, of Boise, Idaho, a son, Joseph Mortimer, December 10, 1925.

PERSONALS

Dr. A. Swanson (Chi. '13), of Vinton, Iowa, has located at Atkinson, Ill., for practice.

Dr. F. G. Cook (West. '02) is city meat, milk, and pure food inspector for Paris, Texas.

Dr. J. P. Hart (McK. '07), of Winchester, Ind., has opened an office at Ridgeville, Ind.

Dr. H. S. Johnson (O. S. U. '15) is now with the Dairy Products Laboratory, of Pittsburgh, Pa.

Dr. A. H. McKellar (Ont. '93), of Waterloo, Iowa, has sold his practice and gone to Florida.

Dr. Harry F. Emick (McK. '01), of Berne, Ind., has sold his practice to Dr. Ruben Sprunger.

Dr. L. W. Kellogg (Chi. '17), formerly of Tama, Iowa, is now located at Cedar Rapids, same state.

Dr. L. R. Stauffer (O. S. U. '25) is associated with Drs. E. E. and J. E. Patterson, of Detroit, Mich.

Dr. Fred C. Pritchard (West. '08), of Tekonsha, Mich., has been appointed Branch County veterinarian.

Dr. A. Joly (Laval '90), of Waterville, Me., displays the title of realtor in addition to that of veterinarian.

Dr. H. Busman (Ont. '95) is treasurer of the United States Department of Agriculture Club, of Omaha, Nebr.

Dr. L. J. Kepp (Chi. '17), of Jackson, Tenn., has sold his small animal hospital to Drs. Coplin and Nowell.

Dr. J. B. Way (K. C. V. C. '14), formerly of Carlisle, Ky., is now located at 307 Madison St., LaGrange, Ky.

Dr. W. R. Knowles (Ont. '14), of Fremont, Ohio, was re-elected justice of the peace, at the November elections.

Dr. O. F. Cox (Colo. '21) has removed from Persia, Iowa, to Portsmouth, Iowa, where he has established a practice.

Dr. E. Brainerd (McGill '93), of Memphis, Mo., is spending the winter in Phoenix, Ariz., accompanied by Mrs. Brainerd.

Dr. C. H. Stange (Iowa '07), of Iowa State College, recently delivered an address before the Lions' Club, of Boone, Iowa.

Dr. Charles H. Rosenstiel (Chi. '08), of Mt. Carroll, Ill., has been re-appointed Carroll County veterinarian for next year.

Dr. H. S. Atkins (Mich. '23) has been appointed Director of Dairy and Foods, Department of Public Health, Pontiac, Mich.

Dr. Garry Singleton (Corn. '14) is again located in New York State. He is doing tuberculosis eradication work with the State forces.

Dr. James McClure (McK. '15), of Highgrove, Ky., recently suffered a badly fractured right leg when the horse he was riding slipped and fell on him.

Dr. G. H. Starr (McK. '17), of Carmi, Ill., has accepted a position with the U. S. Bureau of Animal Industry. His first assignment was at Pottsville, Pa.

Dr. Fred W. Miller (O. S. U. '16), who has been at the Oregon Agricultural College for several years, is now located at 1101 L St. N. W., Apt. 204, Washington, D. C.

Dr. M. E. Kilpatrick (O. S. U. '24), who has been practicing at New Carlisle, Ohio, has entered into a partnership with Dr. C. E. Inskeep (Ont. '95), of Urbana, Ohio.

Dr. Dyar C. Wood (K. C. V. C. '18), of Greensburg, Ind., was seriously injured in an automobile accident which happened recently on a road a short distance from town.

Dr. J. J. Lintner (Chi. '08), B. A. I. veterinarian in charge of tuberculosis eradication work in Illinois, was the speaker at a recent weekly luncheon of the Kiwanis Club, of Joliet, Ill.

Dr. J. E. Thomas (Ont. '07), of Lancaster, Ohio, recently took the Pasteur treatment, as a result of receiving a slight abrasion on his left hand while removing the brain from a cow that had died of rabies.

Dr. William Harward (U. S. C. V. S. '17), formerly of Oakboro, N. C., has formed a partnership with Dr. E. M. Martin (K. C. V. C. '16), under the name of Drs. Harward and Martin, at Albemarle, N. C.

Dr. N. K. Prince (Gr. Rap. '13), of Holland, Mich., was recently confined to his home for two weeks, as the result of a case of blood-poisoning, which developed following an injury received two weeks previously.

Dr. A. C. Ammann (Chi. '09), of Maroa, Ill., a member of the Maroa Township Board of Supervisors, has entered the race as one of the Republican candidates for sheriff of Macon County at the spring primaries.

Dr. F. E. Kling (Ind. '11), who was a candidate for the Democratic nomination for Mayor of Peru, Indiana, has been appointed a member of the Peru Board of Health by Dr. Thomas O. Keller, Republican Mayor-elect of Peru.

Dr. Ward Giltner (Corn. '06), of Michigan State College, recently addressed the Rotary Club, of Ypsilanti, Michigan. He presented some extremely interesting facts on the relation of animal diseases to the welfare of human beings.

Dr. C. J. Marshall (U. P. '94) is at present acting dean of the University of Pennsylvania Veterinary School, due to the fact that the poor health of Dean Klein compelled the latter to take a much-needed, long-postponed, and well-earned rest in the South.

Dean V. A. Moore, of Cornell University, addressed the New York Tuberculosis and Health Conference, in New York City, November 19, on the subject, "Is Sufficient Emphasis Being Given to Bovine Tuberculosis in the New York Demonstrations?"

Dr. Floyd M. Hopper (Ind. '16), of Tipton, Ind., has been appointed assistant inspector to close up the work of tuberculin testing in Kosciusko County, with headquarters at Warsaw, according to an announcement made by Dr. R. C. Julien (McK. '07), state veterinarian.

Dr. W. M. Lynn (Geo. Wash. '16), who has been located at the Union Stock Yards, Nashville, Tenn., has tendered his resignation as assistant veterinary inspector in the Bureau of Animal Industry. Dr. Lynn has located at Lakeland, Fla., where he is engaged in poult culture.

Dr. B. A. Gallagher (Corn. '01), who has been a member of the staff of the Pathological Division of the Bureau of Animal Industry, Washington, D. C., for a number of years, has been appointed Bacteriologist in the Department of Animal Industry, Territory of Hawaii. This is a new position, and Dr. Gallagher will be located at the laboratory at Honolulu. He sailed from San Francisco, November 25.

Dr. George E. Corwin (U. S. C. V. S. '03), Deputy Commissioner on Domestic Animals of Connecticut, addressed the tenth annual meeting of the Middlesex County Farm Bureau, at Durham, Conn., on December 10, 1925. His subject was "Controlling Communicable Diseases Among Animals." Dr. Corwin's department has arranged for a similar address to be made before each of the twenty-three district meetings to be held throughout the State by the Connecticut Milk Producers' Association.